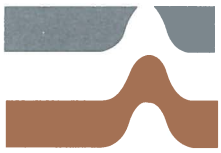
FINAL DATA REPORT
FIELD AND LABORATORY DATA COLLECTION PHASE
CAMINADA HEADLANDS BACK BARRIER
MARSH CREATION INCREMENT II (BA-193)

LAFOURCHE & JEFFERSON PARISHES, LOUISIANA



Ardaman & Associates, Inc.

OFFICES

Orlando - 8008 S. Orange Avenue, Orlando, Florida 32809 - Phone (407) 855-3860
Bartow - 1525 Centennial Drive, Bartow, Florida 33830 - Phone (863) 533-0858
Baton Rouge - 316 Highlandia Drive, Baton Rouge, Louisiana 70884 - Phone (225) 752-4790
Cocoa - 1300 N. Cocoa Blvd., Cocoa, Florida 32922 - Phone (321) 632-2503
Fort Myers - 9970 Bavaria Road, Fort Myers, Florida 33913 - Phone (239) 768-6600
Miami - 2608 W. 84th Street, Hialeah, Florida 33016 - Phone (305) 825-2683
Monroe - 338 Fontana Road, Monroe, Louisiana 71203 - Phone (318) 343-0900
New Orleans - 1305 Distributors Row, Suite I, Jefferson, Louisiana 70123 - Phone (504) 835-2593
Port St. Lucie - 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986 - Phone (772) 878-0072
Sarasota - 78 Sarasota Center Blvd., Sarasota, Florida 34240 - Phone (941) 922-3526
Shreveport - 7222 Greenwood Road, Shreveport, Louisiana 71119 - Phone (318) 636-3673
Tallahassee - 3175 West Tharpe Street, Tallahassee, Florida 32303 - Phone (850) 576-6131
Tampa - 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619 - Phone (813) 620-3389
West Palm Beach - 2200 North Florida Mango Road, Suite 101, West Palm Beach, Florida 33409 - Phone (561) 687-8200

MEMBERS:
A.S.F.E.
American Concrete Institute
ASTM International
Florida Institute of Consulting Engineers

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

April 17, 2018
AAI File: 17-2810

Coastal Protection and Restoration Authority
P.O. Box 44027
Baton Rouge, LA 70804

Attention: Ms. Renee Bennett– PMP
Renee.s.bennett@la.gov

Re: Final Data Report – Field and Laboratory Data Collection Phase
Caminada Headlands Back Barrier Marsh Creation Increment II (BA-193)
Lafourche & Jefferson Parishes, Louisiana

We have completed the field exploration and the laboratory testing phases for the Caminada Headlands Back Barrier Marsh Creation Increment II (B-193) project. A summary of the field exploration and laboratory testing results, and our evaluation of the data with discussion of geotechnical design properties, are provided in the attached Draft Data Report. A portion of this work was authorized by Task #5 Notice to Proceed dated February 13, 2017 under our previous contract No. 4400005545, and by Task #2, Amendment #1 Notice to Proceed dated February 19, 2018 under our current contract No. 4400012418 with the Coastal Protection and Restoration Authority (CPRA).

Sincerely,
ARDAMAN & ASSOCIATES, INC.
LAPELS No. EF.0001680

GEORGE F. SEGRÉ QUILICHINI, P.E.
ASSISTANT PROJECT ENGINEER

STATE OF LOUISIANA
ROBERT J. WERNER
License No. 36633
PROFESSIONAL
ENGINEER
IN
CIVIL ENGINEERING
4/17/18

ROBERT J. WERNER, P.E.
PRINCIPAL ENGINEER
LOUISIANA LICENSE NO. 36633

Flash Drive

1305 Distributors Row, Suite I, Jefferson, Louisiana 70123 Phone (504) 835-2593 Fax (504) 835-2982
Louisiana: Alexandria, Baton Rouge, Monroe, New Orleans, Shreveport
Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach

DRAFT DATA REPORT
FIELD AND LABORATORY DATA COLLECTION PHASE
CAMINADA HEADLANDS BACK BARRIER MARSH CREATION INCREMENT II (BA-193)
LAFOURCHE & JEFFERSON PARISHES, LOUISIANA

Results and findings of the field exploration and laboratory testing phases of the Caminada Headlands Back Barrier Marsh Creation Increment II (BA-193) project are provided herein. Soil boring logs, along with a description of terms and symbols used on the boring logs, Cone Penetration Test (CPT) sounding plots, and generalized subsurface profiles are provided in Appendix A. Laboratory test data plots are included in Appendices B through D, and results of a magnetometer survey are provided in Appendix E.

SECTION 1. GENERAL PROJECT INFORMATION

1.1 Project Description

The Caminada Headlands Back Barrier Marsh Creation Increment II project has two main goals: (i) to create and/or nourish 444 acres of back barrier marsh through the use of pumped sediment from an offshore borrow site; and (ii) to create a platform upon which beach and dune can migrate, thereby reducing the likelihood of breaching. The proposed project is intended to slow the current trend of degradation in the headland. According to the Coastal Protection and Restoration Authority (CPRA), the Caminada Headland has experienced some of the highest shoreline retreat rates in Louisiana, with recent measurements exceeding 80 feet per year between 2006 and 2011. The increased land loss rates are reported to have occurred when breaches in the headlands formed during tropical storm or hurricane events and then remained open for extended periods of time which increase flow velocities and hence erosion of sediment from the headlands.

The scope of work associated with the original field and laboratory data collection phase for this project consisted of performing a total of two (2) soil borings to a depth of 40 feet below the existing mudline and a total of six (6) Cone Penetration Test (CPT) soundings to refusal depth. Three additional CPT soundings were performed within the east-end of the project alignment in March 2018 once access rights were obtained by CPRA. All soil boring and CPT sounding locations were established in coordination with the CPRA.

1.2 Site Location and Description

The site is located in Region 2 of the Barataria Basin in Lafourche and Jefferson Parishes. The entirety of the project lies between La Hwy. 3090 in Port Fourchon to the South and Caminada Pass to the Northwest, encompassing about 9 miles of beach dunes. The Increment II (BA-193) project encompasses an alignment of about six miles (Figure 1).

1.3 Site Geology

The site is located on a historical delta coast, which benefited from Bayou Lafourche, and Bayou Moreau, and other distributaries to these bayous. In 1905, the flow into Bayou Lafourche from the Mississippi River was substantially reduced as a results of impounding efforts upstream near Donaldsonville, Louisiana. Geologically, the site is mainly comprised of Holocene Age barrier island type beach deposits in the near surface, which can be underlain by nearshore, intra-delta, or inter-distributary deposits to about Elev. -100 ft., NGVD. These are underlain by prodelta and nearshore deposits to about Elev. -180 to -200 ft., NGVD where Pleistocene Age substratum sands are encountered.

SECTION 2. FIELD EXPLORATION

2.1 Permission and Access

Prior to entering the site to establish the boring locations and conduct site reconnaissance, the landowners listed in the Section 4.1 of the *Scope of Services for In-shore Geotechnical Investigations and Engineering Services, Caminada Headlands Back Barrier Marsh Creation Increment II (BA-193)* document were notified and site access was granted by means of a signed agreement signed on March 8, 2017. Additionally, a bird abatement survey was performed by SWCA Environmental Consultants for CPRA prior to Ardaman and Associates, Inc. (AAI) mobilizing to perform soil borings and CPT soundings. The bird abatement survey was performed to identify the need to take preventative actions in order to minimize impacts to migratory birds and endangered species of birds, such as the piping plover. Results of the survey were furnished to AAI by CPRA.

2.2 Magnetometer Survey

As per Section 4.6 of the *Scope of Services for In-shore Geotechnical Investigations and Engineering Services, Caminada Headlands Back Barrier Marsh creation Increment II (BA-193)* document, a magnetometer survey was performed by T. Baker Smith (TBS) for AAI at all of the proposed soil boring and CPT sounding locations. Results of the survey are provided in Appendix E of this report for reference. T. Baker Smith also provided conventional surveying services to determine the location and mudline elevation for each soil boring and CPT sounding.

2.3 Soil Borings

Two (2) soil borings (B-10 and B-11) were performed at the locations shown on Figure 2. These borings were performed in the back marsh, along the proposed containment dike alignment. The borings were performed on July 11 and 12, 2017.

The soil borings were performed using an airboat-mounted, rotary-type drilling rig. The borings were advanced using 4-inch diameter rotary wash methods to depths of 40 feet below the existing mudline or ground surface. Discrete samples were obtained continuously within the upper 20 feet and then on five-foot sampling intervals thereafter.

In cohesive and semi-cohesive soils, relatively undisturbed samples were obtained using a 3-inch diameter, 30-inch long, thin-walled Shelby tube. In this sampling procedure, the borehole is advanced to the desired depth, and the Shelby tube is lowered to the bottom of the boring and is then pushed into the soil in one continuous 24-inch stroke.

Upon retrieval, the exposed face of the sample at the end of the tube was visually classified and then the sample was sealed in the tube with an expandable disk-type seal and plastic caps. Each sample tube was labeled and placed vertically in a fabricated tube rack to avoid disturbance to the sample during transport. All the sample tubes obtained were transported to our laboratory for extrusion and testing.

In the more granular, non-cohesive soils, which are not effectively sampled by means of a Shelby tube, the Standard Penetration Test (SPT) sampling was performed. The SPT test consists of driving a two-inch diameter split-spoon sampler 1 foot (after first seating it 6 inches) with a 140 lb. hammer falling 30-inches. The number of blows required to drive the sampler gives an indication of the consistency of the material.

Table 2.1 Soil Boring Details

Boring ID	Depth (feet)	Latitude	Longitude	Ground Surface or Mudline Elevation (feet, NAVD88)	Water* Surface Elevation (feet, NAVD88)
B-10	40	29° 09' 14.02"	90° 07' 02.28"	-0.2	1.0
B-11	40	29° 10' 02.47"	90° 05' 46.18"	-0.5	1.3

* Water surface elevation based on surveyed mudline elevation and the recorded depth from the water surface to the mudline at the time of drilling.

A total of 16 thin-walled tube samples were obtained during the field exploration program. Sample recovery lengths were measured in the field and upon extrusion in the laboratory. In general, cohesive soil sample recovery ranged from 81 to 100 percent, with an average recovery of 94.

2.4 Cone Penetration Test (CPT) Soundings

Twelve (12) CPT soundings were performed at the shown on Figures 3 and 4. All of the CPT soundings were performed along the proposed rear containment dike alignment.

The CPT soundings between CPT-28 and CPT-37 were performed from July 5 to July 11, 2017. The CPT Soundings between CPT -48 and CPT-53 were performed from March 19 to March 20, 2018. This second mobilization was performed with the intent of characterizing the easternmost subsoils of the project area. It was intended that three to four (3-4) CPT soundings be performed, however, access to CPT-54 was not possible, therefore this CPT sounding was not performed.

The CPT soundings were advanced to the refusal depth using an airboat mounted CPT-rig. Refusal occurred when the resistance to penetration exceeded the reaction force provided by the weight of the airboat, at depths ranging from about 7 to 21 feet. The coordinate locations and mudline elevations of the CPT soundings are summarized in Table 2.2.

Table 2.2 CPT Sounding Details

CPT	GPS Coordinates		Elevation (feet, NAVD88)		
	Latitude	Longitude	Mudline	CPT Refusal and/or Termination	Water* Surface Elevation
CPT-28	29° 08' 13.3"	90° 08' 37.2"	-0.7	-17.4	+0.0
CPT-29	29° 08' 21.6"	90° 08' 24.4"	-2.5	-18.6	-1.5
CPT-30A	29° 07' 30.2"	90° 08' 09.7"	-3.0	-9.0	-2.0
CPT-31	29° 08' 41.0"	90° 07' 53.6"	-2.1	-4.6	-1.1
CPT-32	29° 08' 52.1"	90° 07' 36.8"	-1.9	-4.6	+0.6
CPT-33	29° 09' 15.3"	90° 07' 03.3"	-0.2	-11.3	+1.2
CPT-34	29° 09' 30.7"	90° 06' 41.1"	-0.4	-8.0	+0.9
CPT-35	29° 09' 39.6"	90° 06' 22.8"	-1.6	-15.8	-0.4
CPT-37	29° 10' 02.9"	90° 05' 46.0"	-0.5	-15.6	+0.4
CPT-48	29° 10' 21.3"	90° 05' 17.7"	-1.5	-10.1	+0.0
CPT-50	29° 10' 33.3"	90° 04' 59.9"	-1.7	-9.7	+0.0
CPT-53	29° 10' 56.0"	90° 04' 25.6"	-1.0	-11.9	+0.0

* Water surface elevation based on surveyed mudline elevation and the recorded depth from the water surface to the mudline at the time of drilling.

The CPT soundings were conducted in general accordance with the procedure outlined in ASTM D5778. The piezocone has a sixty-degree apex with a pore pressure sensing element located directly behind the tip (i.e., in the u_2 position). The piezocone provides a nearly continuous record of tip resistance (q_c), sleeve friction resistance (f_s), and penetration pore pressure (u_2) with depth. The piezocone was advanced in one-meter increments at a relatively constant rate of approximately two centimeters per second using a hydraulic press. CPT sensor data was converted to engineering units and plotted using the program gINT by Bentley Systems, Inc. and Microsoft Excel.

SECTION 3. LABORATORY TESTING

Upon completion of, our field exploration work, soil samples were transported to our laboratory. The tube samples were stored in secure racks in an upright position and protected from vibration. The samples were extruded from the sampling tubes in the laboratory using a specially fabricated hydraulic press with a piston-type head.

In light of the very soft character of the samples, particularly those obtained from depths less than about 10 feet below the mudline, sample extrusion was coordinated with specimen selection and testing to minimize sample disturbance. In order to preserve representative portions for later consolidation and strength testing, the bottom 6-inch section of several tube samples (which typically exhibit the least sampling disturbance effects) were cut using a fine-toothed band saw and sealed in the sampling tube section. The remainder of the tube sample was then extruded, classified and subjected to index and compressive strength testing. Hand-operated Torvane shear strength tests and/or pocket penetration strength tests were also performed primarily to assess strength variability within the sample group. This procedure enabled evaluation of the corresponding classification and index strength data to guide selection of samples for the more sophisticated consolidation and strength testing.

In order to avoid disturbance that might otherwise occur due to bonding of the sample to the inside of the galvanized steel sampling tube during the testing program period, a special technique was used for extrusion of samples from the 6-inch cut sections. Specifically, a thin wire was carefully inserted along the edge of the sample and inside face of the tube and was then held taught to enable wire-cutting around the circumference of the sample prior to careful manual extrusion. This technique was developed and is standard practice in the geotechnical laboratory at the Massachusetts Institute of Technology (Germaine and Germaine, 2009).

An overview of the scope of the laboratory testing phase in terms of the type and number of tests performed is presented in Table 3.1. Results of the laboratory tests and their implication with

respect to design material property selection are presented and discussed in the following sections of this report.

Table 3.1 Laboratory Testing Summary

Test Method	ASTM Reference	Number of Tests Performed
Unconsolidated Undrained (UU) Triaxial Compression Test	D2850	9
Consolidation Test	D2435	4
Atterberg Limit Determination	D4318	12
Moisture Content	D2216	46
Grain Size Analysis	D1140, and D422	24
Unit Weight Determination	D2937	22

3.1 Classification and Index Testing

Subsurface conditions, in terms of soil classification, geotechnical index properties, effective stress history, and undrained shear strength profiles encountered at the two (2) boring locations within the marsh creation area are somewhat similar. For a detailed description, refer to the individual boring logs provided in Appendix A. In general, an upper layer of about 2 to 10 ft. of clay (CH), or organic clay (OH) was encountered with interbedded seams or layers of more granular material. A relatively dense granular layer of silts and sands underlies these softer upper clays, with a trend of increasing thickness towards Caminada Pass, and away from Port Fourchon. This granular layer is underlain by soft to medium stiff clay with silt seams to about Elev. -35 ft. The remainder of the explored depth of 40 feet consists of silty sand (SM), sandy silt (ML), and sand (SP) layers.

3.1.1 Visual Classification

Visual classification included description of soil color, consistency and type, and identification of structural conditions (layering, seams, etc.) and variations (e.g., organics). Visual classifications for the soil samples obtained from the site are included on the soil boring logs in Appendix A.

3.1.2 Moisture Content and Density

Moisture content determinations (ASTM D2216) and total unit weight determinations (ASTM D2937) were performed in conjunction with the sample extrusion process and preparation of test specimens. Total unit weights of the tube samples were computed based on sample volume and

weight measurements taken after exclusion of any materials that appeared to have been disturbed during the sampling or extrusion process. Moisture content determinations were made for each extruded sample, and total densities were computed for each sample. Considering that all samples were obtained either at or below the water surface, degrees of saturation were computed to confirm that the density and moisture content values correspond to near 100 percent saturation as a quality control measure. Moisture content and total density values for each sample are included on the soil boring logs in Appendix A.

Variations in moisture content versus depth below the mudline or ground surface at all of the soil boring locations within the project area are illustrated on Figure B.1 (Appendix B) adjacent to the preliminary design property selection. Moisture contents generally range between 25 and 80 percent, however, the organic samples obtained from B-11 show highly elevated moisture contents within the upper few feet, which exceed 300 percent.

Variations in total unit weight versus depth below the mudline or ground surface for boring locations within the project area are also illustrated on Figure B.1 alongside a preliminary design property profile. In general, total unit weights range between 70 and 120, with the low end representing the highly organic samples, and the high end corresponding to the more granular soils.

3.1.3 Atterberg Limits

Twelve (12) Atterberg limit determinations (ASTM D4318) were performed on selected samples to assist in soil classification and to enable correlation to pertinent clay behavior properties. The Atterberg limit data consist of measured liquid limit (LL) and plastic limit (PL) values from which the plasticity index (PI = LL – PL) is derived. The individual test data are included on the boring logs in Appendix A. The test results are also presented in terms of the plasticity chart on Figure B.2, and variation with depth on Figure B.1 (Appendix B) adjacent to the preliminary design property selection. The data indicate that for boring B-10, the majority of the clay samples are fat clays (CH), whereas for boring B-11, the upper soils consists of highly plastic and organic clays, classifying as CH or OH type soil in accordance with the Unified Soil Classification System. Liquid limits within the upper 10 feet are generally highly variable, ranging from about 60 to 230 percent. Clay soils encountered at depths greater than about 10 feet are somewhat less plastic, classifying as CL- or CH- type clay soils with liquid limits typically ranging from about 35 to 80 percent.

The Liquidity Index (LI) is a parameter that characterizes the *in-situ* moisture content of a sample in relation to its liquid and plastic limit values (LI= [MC-PL]/PI). Clay soils having high liquidity indices, i.e., approaching or even greater than 1.0, have *in-situ* water contents that are near to or above their liquid limit, which is characteristic of very soft and compressible "normally consolidated" or very lightly overconsolidated conditions. As can be seen on Figure B.3, these compressible type conditions are prevalent in the near surface deposits from the mudline down

to a depth of about 5 feet as evident in the elevated liquidity index values. Soils in the upper 5 feet with low liquidity indexes are influenced by the sand content of the samples. Liquidity index values throughout the project area tend to decline with depth.

3.1.4 Particle Size Distribution

Five (5) hydrometer analyses (ASTM D422) and 19 fines content determinations (ASTM D 1140) were performed on selected samples. The test results, in terms of percent fines (i.e., percent by dry weight finer than the U.S. No. 200 sieve size, 0.074 mm, or combined silt and clay fraction) are included on the soil boring logs in Appendix A. Individual hydrometer test results, in terms of grain size distribution curves, are included on Figures B.4-1 to B.4-5 (Appendix B).

3.2 Consolidation Tests

Incremental consolidation tests (ASTM D 2435) were included in the laboratory testing program to assess the stress history one-dimensional stress-deformation and time-rate of consolidation characteristics of the marsh clay deposits that will dictate post-construction settlement of the marsh creation area. A total of 4 tests were conducted.

Considering the very soft and compressible character of the near surface clay samples, the laboratory consolidation tests were performed using a reduced load increment ratio, LIR, on the order of 0.5 (versus the customary increment ratio of 1.0 where loads are doubled in each increment). The use of a lower LIR improves resolution of the compression curve and provides more data within the low effective stress range around the *in-situ* and final design stresses beneath the proposed containment dikes and marsh fill loads. The use of the lower LIR does, however, extend the test duration since the number of load increments normally required to complete a test increases by a factor of two. Tests performed on these samples typically included one unload-reload cycle to enable evaluation of recompression behavior.

During each load increment, the accumulation of vertical displacement with time is measured. In general, each load increment was sustained for a period of 12 to 24 hours. The vertical displacement versus time data were evaluated using conventional log-time and square-root time curve fitting techniques to estimate the end of primary consolidation (i.e., the point in time at which dissipation of load-induced excess pore water pressures in the sample had dissipated and drained creep ensued for each load increment). The individual test results, in terms of vertical strain versus effective vertical stress are presented in Appendix D.

Typical laboratory consolidation test results, considered in terms of vertical strain, ε_v (%; at the end of primary consolidation) or void ratio, e_o, versus vertical effective stress, σ'_{vc} (tons/ft^2; log scale), may be simply characterized as being composed of recompression and virgin compression. The flatter recompression portion of the ε_v versus log σ'_{vc} curve occurs at vertical effective stresses lower than the preconsolidation pressure, σ'_p to which the specimen had historically

been subjected. The steeper virgin compression portion of the ε_v versus log σ'_{vc} response occurs at vertical effective stresses greater than the maximum past pressure, σ'_p. In the case of near surface soils, particularly within the upper 10 from the mudline, the preconsolidation is "apparent", and most likely results from post-deposition drained creep and partial desiccation.

3.2.1 Compression Characteristics

The compression ratio, CR, is defined as the slope of the virgin compression portion of the ε_v versus log σ'_{vc} curve and can be used to predict the magnitude of consolidation settlements for normally consolidated foundation clays. Compression ratios for the soft organic clay deposit samples tested from depths less than about 10 feet below the mudline, range from 0.22 to 0.26, with an average value of 0.24. The compression index, C_c, characterizes the slope of the void ratio, e, versus log σ'_{vc} curve, and is equal to $(1+e_o)$ x CR where e_o is the initial specimen void ratio. The average compression index to a depth of about 10 feet is 0.96. Site-specific correlations between the virgin compression parameters CR and C_c and various index properties are shown in Figure B.5.

The slope of the recompression portion of the laboratory consolidation curve is used to estimate primary consolidation settlement magnitudes for stress increments resulting in final stress levels less than the preconsolidation pressure. Because the initial recompression behavior in the laboratory test can be influenced by sample disturbance (sampling stress relaxation, etc.), an unload-reload sequence is typically included in the laboratory test to enable better assessment of *in-situ* recompression behavior. The recompression ratio, RR, is defined as the slope of the recompression portion of the ε_v versus log σ'_{vc} curve. Recompression ratios for samples obtained from depths less than about 10 feet below the mudline range from 0.011 to 0.014, with an average value of 0.013.

The continued accumulation of vertical strain with time subsequent to the end of primary consolidation is referred to as secondary consolidation (or drained creep). This component of clay compression behavior is important to estimating long-term settlements (and to the overall coastal subsidence situation). The coefficient of secondary compression, $c_{\alpha\varepsilon}$, quantifies the creep rate in terms of strain per log cycle of time after the end of primary consolidation. This parameter is derived from the individual load increment time curves generated during the consolidation tests. It is generally acknowledged that the ratio between the coefficient of secondary compression and primary compression ratio (i.e., increment "CR" being the tangential slope of the ε_v versus log σ'_{vc} curve at a given stress level) tends to be a constant value for a given material (Mesri and Castro, 1987). This behavior is relied upon for estimating long-term creep settlement behavior. The relationship between $c_{\alpha\varepsilon}$ and CR for samples tested is illustrated in Figure B.6 (Appendix B).

3.2.2 *Preconsolidation Pressure*

Any elements within the natural ground clay having a preconsolidation pressure equal to the *in-situ* vertical effective stress (i.e., $\sigma'_{vc} = \sigma'_p$) are considered to be normally consolidated. Elements with *in-situ* vertical effective stresses less than the maximum past pressure are considered to be overconsolidated (the higher past stresses are most likely associated with post-deposition drained creep and desiccation related to vegetation within the upper 10 feet at the subject site). These two stresses define the stress history of a clay element which, in turn, strongly influences its undrained shear strength and future compression behavior when loaded. Determination of the maximum past pressure is, therefore, critical to the evaluation. This determination involves estimating the vertical effective stress at which the transition from recompression to virgin compression occurs. Since the actual ε_v versus log σ'_{vc} curves measured in the laboratory do not consist simply of the two linear portions as discussed above, several techniques are conventionally used to provide an estimate of the maximum past pressure. The Casagrande construction method (Casagrande, 1936) was used in our evaluation of the laboratory data.

Estimated maximum past pressure, σ'_p, values are included on the individual test summary plots in Appendix D and are summarized versus depth on Figure B.1 (Appendix B). The data indicate slight degrees of overconsolidation (i.e., $\sigma'_p > \sigma'_{vo}$) within the upper 10 feet below the mudline.

3.2.3 *Coefficient of Consolidation*

The coefficient of consolidation, c_v, is a parameter that quantifies the time-rate of consolidation and is dependent on, among other things, the material type and stress history. Coefficients of consolidation were computed using square-root and logarithm of time curve fitting techniques for each load increment applied during the consolidation tests. The relationship between the laboratory measured coefficient of consolidation (taken as the arithmetic average of the two curve fitting techniques) and the applied effective stress is presented for each test in Appendix D, and plotted against the stress ratio (σ'_v / σ'_p) on Figure B.6.

3.3 Strength Tests

The strength characteristics of the marsh deposits are important for geotechnical engineering analyses, particularly with regard to stability of the containment dikes.

3.3.1 *Unconsolidated-Undrained Triaxial Compression Tests*

A total of 9 unconsolidated-undrained (UU) triaxial compression tests (ASTM D2850) were performed on specimens trimmed from selected samples. Results of these strength tests are included on the soil boring logs in Appendix A. Individual UU test stress-strain curves are included in Appendix C. Undrained shear strengths from the UU compression tests are plotted versus

depth in Figure B.1 (Appendix B). The test results indicate, as expected, relatively low undrained shear strengths in the surficial marsh deposits with a slight increase with depth.

SECTION 4. CPT INTERPRETATION

As mentioned previously, the piezocone provides a nearly continuous record of tip resistance (q_c), sleeve friction resistance (f_s), and penetration pore pressure (u_2) with depth. These data are used to aid in the determination of soil stratigraphy and may be used to empirically derive soil properties. The measured penetration tip resistance, sleeve friction, and pore pressure are plotted versus depth and elevation for each sounding on the CPT logs provided in Appendix A.

4.1 Soil behavior type

In general, the interpretation of soil stratigraphy is based on a soil behavior type (SBT), which is obtained by plotting the friction ratio, $R_f = (f_s/q_c)100\%$, against the tip resistance. More recently, empirical relationships to the corrected rip resistance, $q_t = q_c + u_2(1\text{-}a)$, where "a" is the net area ratio, are gaining popularity. These and other similar methods (normalized soil behavior type graphs) derive "zones" which identify the soil behavior type, based on where the data plot. It should be mentioned that these zones are based on the behavior of the soil, and not on the actual soil, therefore judgement in the interpretation is warranted.

For this project, the normalized soil behavior type, SBT_n, chart suggested by Robertson 1990, which also includes the normalized pore pressure parameter, $B_q = \Delta u/q_n$, where Δu is the excess pore pressure and q_n is the net cone resistance ($q_t - \sigma_{vo}$). This method identifies nine (9) distinct soil behavior zones, as summarized in Table 4.1. As can be seen the total overburden at depth plays a role in the determination of the SBT_n, however, gINT utilizes a default value of 120 pcf. for all soil types. Therefore, consideration was given to the results of laboratory testing, and our experience in the area to develop the following values for use in analysis:

Table 4.1 CPT Normalized Soil Behavior Type (SBT) – Robertson (1990)

Zone	Soil Behavior Type	Total Unit Weight (pcf.)
1	Sensitive, fine grained	80
2	Organic soils-peats	85
3	Clays - clay to silty clay	100
4	Silt mixtures – clayey silt to silty clay	105
5	Sand mixtures – silty sand to sandy silt	110
6	Sands – clean sands to silty sands	115
7	Gravelly sand to sand	120
8	Very stiff sand to clayey sand	120
9	Very stiff fine grained	130

Based on the results from results from the CPT and the boring logs, it is believed that this results in an adequate interpretation of soil behavior types.

4.2 Undrained Shear Strength

Also included on the CPT logs is an estimation of the undrained shear strength (s_u). Undrained shear strength values were derived from the corrected CPT tip resistance (q_t) using the correlation $s_u = (q_t - \sigma_{vo})/ N_{kt}$, where σ_{vo} is the total overburden stress and N_{kt} is the Cone Factor which varies regionally and is somewhat site specific. For this project, undrained shear strengths were estimated using an N_{kt} value of 15. This value was selected by correlating undrained shear strengths derived from the CPT data to the results of the unconsolidated-undrained (UU) triaxial compression tests performed on samples collected from the soil borings. As can be seen on Figure B.1-3, the lower bound of the undrained shear strength profiles derived from the CPT data tend to coincide with an undrained strength ratio, (s_u/σ'_v) of 0.23, which is characteristic of the soft clays in southern Louisiana.

SECTION 5. DISCUSSION

5.1 Borrow Material Selection and Design Properties

Borrow material selection and design properties are discussed in our Final Geotechnical Data Report – Offshore Borrow Investigation Deport No. 17-2810A and dated February 9, 2018. This report characterizes the proposed *in-situ* borrow material in terms of index tests, and by means

of more specialized low-stress consolidation testing and settling column tests performed on manufactured "composite" samples. The results of this separate report will be used in the Design Report for this project.

5.2 Design Report

Based on an evaluation of the data obtained during the field and laboratory testing phase of work, we believe that sufficient data has been collected in order to perform the analyses required for the design phase. Presented on Figure B.1 is a preliminary design undrained shear strength profile for an idealized "mostly clay" profile, however, as evident in the fence diagram provided in Figure A.3, there are significant granular sublayers. The design parameters will be adjusted on a case-by-case basis to account for these granular soils along with additional furnished data from previous subsurface investigations performed across the subject site.

SECTION 6. REFERENCES

Casagrande, A. (1936), "*The Determination of the Pre-consolidation Load and its Practical Significance*", Proceedings, First International Conference on Soil Mechanics and Foundation Engineering, Cambridge, Vol. 3, pp 60-64.

Germaine, J., and Germaine, A. (2009). "*Geotechnical Laboratory Measurements for Engineers*". Hoboken, New Jersey: John Wiley and Sons, Inc.

Mesri, G. and Castro (1987), "*C_α/C_c Concept and K_0 during Secondary Compression*". ASCE, JGGE, 113(3), pp 230-247.

FIGURES:

Apr 08, 2018 - 9:54am

C:\Users\George.Segre\appdata\local\temp\AcPublish_12132\Boring-CPT-locations.dwg

Caminada HL Back Barrier
Marsh Creation
Jefferson and Lahourche
Parishes, Louisiana

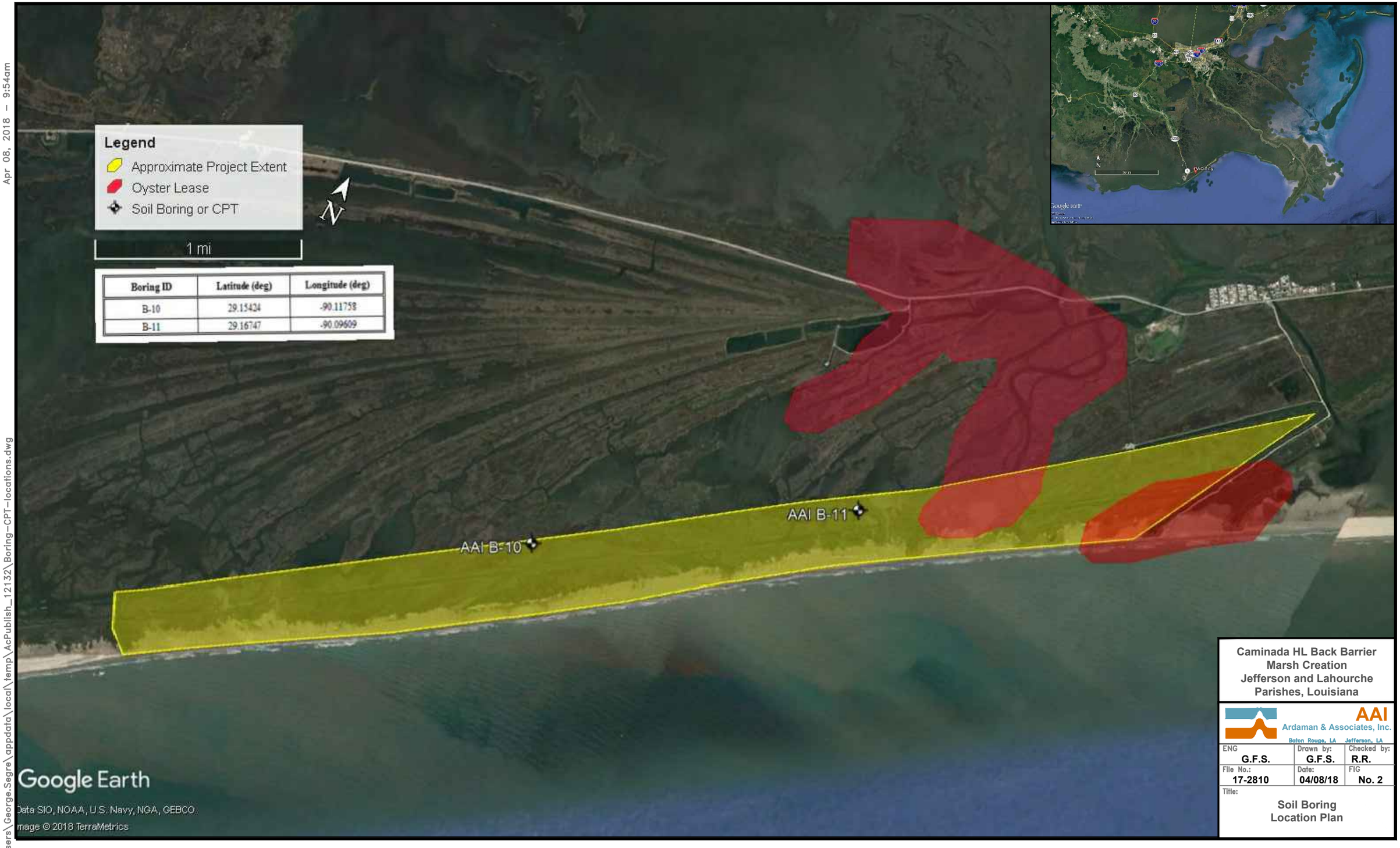
AAI
Ardaman & Associates, Inc.
Baton Rouge, LA Jefferson, LA

ENG	Drawn by:	Checked by:
G.F.S.	G.F.S.	R.R.
File No.:	Date:	FIG
17-2810	04/08/18	No. 1

Title:

General Project
Alignment

Apr 08, 2018 - 9:54am



Boring ID	Latitude (deg)	Longitude (deg)
B-10	29.15424	-90.11758
B-11	29.16747	-90.09609

Caminada HL Back Barrier
Marsh Creation
Jefferson and Lahourche
Parishes, Louisiana

AAI
Ardaman & Associates, Inc.
Baton Rouge, LA Jefferson, LA

ENG	Drawn by:	Checked by:
G.F.S.	G.F.S.	R.R.
File No.: 17-2810	Date: 04/08/18	FIG No. 2

Title:
Soil Boring
Location Plan

C:\Users\George.Segre\appdata\local\temp\AcPublish_12132\Boring-CPT-locations.dwg

Apr 08, 2018 - 9:54am

C:\Users\George.Segre\appdata\local\temp\AcPublish_12132\Boring-CPT-locations.dwg

CPT ID	Latitude (deg)	Longitude (deg)
CPT-28	29° 08' 13.3"	90° 08' 37.2"
CPT-29	29° 08' 21.6"	90° 08' 24.4"
CPT-30A	29° 07' 30.2"	90° 08' 09.7"
CPT-31	29° 08' 41.0"	90° 07' 53.6"
CPT-32	29° 08' 52.1"	90° 07' 36.8"
CPT-33	29° 09' 15.3"	90° 07' 03.3"
CPT-34	29° 09' 30.7"	90° 06' 41.1"
CPT-35	29° 09' 39.6"	90° 06' 22.8"
CPT-37	29° 10' 02.9"	90° 05' 46.0"
CPT-48	29° 10' 21.3"	90° 05' 17.7"
CPT-50	29° 10' 33.3"	90° 04' 59.9"
CPT-53	29° 10' 56.0"	90° 04' 25.6"

Caminada HL Back Barrier Marsh Creation
Jefferson and Lahourche Parishes, Louisiana

AAI
Ardaman & Associates, Inc.
Baton Rouge, LA Jefferson, LA

ENG	Drawn by:	Checked by:
G.F.S.	G.F.S.	R.R.
File No.: 17-2810	Date: 04/08/18	FIG No. 3

Title:
Cone Penetration Test (CPT) Location Plan

Boring ID	Latitude (deg)	Longitude (deg)
B-10	29.15424	-90.11758
B-11	29.16747	-90.09609

CPT ID	Latitude (deg)	Longitude (deg)
CPT-28	29° 08' 13.3"	90° 08' 37.2"
CPT-29	29° 08' 21.6"	90° 08' 24.4"
CPT-30A	29° 07' 30.2"	90° 08' 09.7"
CPT-31	29° 08' 41.0"	90° 07' 53.6"
CPT-32	29° 08' 52.1"	90° 07' 36.8"
CPT-33	29° 09' 15.3"	90° 07' 03.3"
CPT-34	29° 09' 30.7"	90° 06' 41.1"
CPT-35	29° 09' 39.6"	90° 06' 22.8"
CPT-37	29° 10' 02.9"	90° 05' 46.0"
CPT-48	29° 10' 21.3"	90° 05' 17.7"
CPT-50	29° 10' 33.3"	90° 04' 59.9"
CPT-53	29° 10' 56.0"	90° 04' 25.6"

Caminada HL Back Barrier
Marsh Creation
Jefferson and Lahourche
Parishes, Louisiana

AAI
Ardaman & Associates, Inc.
Baton Rouge, LA Jefferson, LA

ENG	Drawn by:	Checked by:
G.F.S.	G.F.S.	R.R.
File No.:	Date:	FIG
17-2810	04/08/18	No. 4

Title:
Soil Boring & CPT
Location Plan

Apr 08, 2018 - 9:54am

C:\Users\George.Segre\appdata\local\temp\AcPublish_12132\Boring-CPT-locations.dwg

Appendix A. SOIL BORING LOGS, CPT LOGS AND PROFILES

This Appendix contains the following:

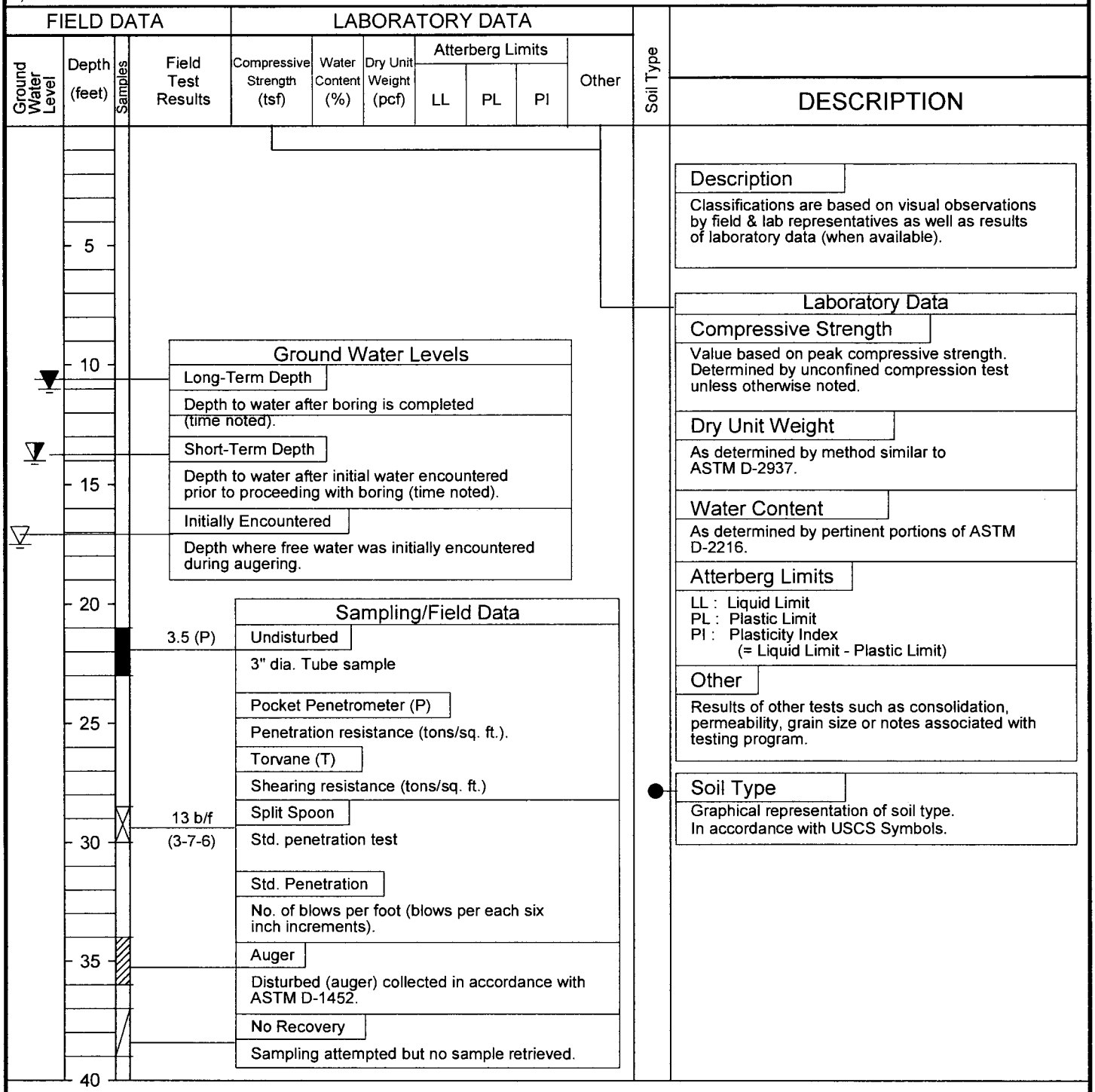
A.1 Soil Boring Logs

A.2 CPT Sounding Logs

A.3 Fence Diagram

A.4 Raw CPT Data Files (Digital Copy Only)

DESCRIPTION OF TERMS AND SYMBOLS USED ON SOIL BORING LOG



Ground Water Level Data	Boring Advancement Method	Notes
	Boring Abandonment Method	

Form LOGTERMS

Strata Boundaries May Not Be Exact

Caminada Headlands Back Barrier
Marsh Creation Increment II
(BA-193)
Lafourche & Jefferson Parishes

Coastal Protection and Restoration
Authority (CPRA)
150 Terrace Ave.
Baton Rouge, LA 70802

LOG OF SOIL BORING B-10

Ardaman & Associates, Inc.

Sheet 1 of 1

File: 17-2810
Date: 7/12/17
Logged by: R. Perry
Driller: A. Donald
Rig: Airboat

Location: Lat. 29° 9' 15.3"
Long. 90° 8' 37.1"
Surface Elevation: -.2 (ft., NAVD 88)

FIELD DATA				LABORATORY DATA									
Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Organic Content (%)	Soil Type	Description
▽				0.15 t=1.0 0.11 t=2.0	62 68 32 83 36	100 97 95 107	66 49	20 18	46 31	18			Very Soft gray CLAY (CH) w/ sand & silt pockets
	5				33 30 34 31	117 110	39	18	21	76			Soft gray LEAN CLAY (CL) w/ sand & silt seams (4-6 ft. Hydro= 24.4% Sand / 65.7% Silt / 10% Clay)
	10		7 b/f 4-3-4		34								Medium Dense to Dense gray CLAYEY SAND (SC)
			13 b/f 3-5-8		28					24			
			48 b/f 8-19-29		28					71			(12-14 ft. Hydro= 71% Sand / 22.3% Silt / 6.7% Clay)
	15		19 b/f 11-11-8		35								
			12 b/f 4-5-7		35 31		35 35	16 18	19 17	89			Medium Stiff gray SANDY CLAY (CL)
	20				31	118							Soft gray LEAN CLAY (CL) w/ sand & silt seams
	25				73 54	105				100			Soft gray CLAY (CH)
	30				57 58	120	61	20	41	98			
	35		50/3" b/f 24-50		45					66			Very Dense gray SANDY SILT (ML) w/ clay
	40		56 b/f 8-26-30		34		NP	NP	NP	25			Very Dense gray SILTY SAND (SM) w/ trace clay
													Boring completed at 40 ft.

Ground Water Level Data

▽ Boring Conducted in Water

Boring Advancement Method

Wash borehole full depth:
0 to 40 ft.

Boring Abandonment Method

Borehole grouted with cement/ bentonite upon completion

Notes

t = Lateral Confining Pressure (psi).

Strata Boundaries May Not Be Exact

ARD LOG01R - NAPOLEON 17-84-2810.GPJ LOG01.GDT 8/15/17

Figure No. A.1-1

Caminada Headlands Back Barrier
Marsh Creation Increment II
(BA-193)
Lafourche & Jefferson Parishes

Coastal Protection and Restoration
Authority (CPRA)
150 Terrace Ave.
Baton Rouge, LA 70802

LOG OF SOIL BORING B-11

Ardaman & Associates, Inc.

Sheet 1 of 1

File: 17-2810
Date: 7/11/17
Logged by: R. Perry
Driller: A. Donald
Rig: Airboat

Location: Lat. 29° 10' 2.9"
Long. 90° 5' 45.9"
Surface Elevation: -.5 (ft., NAVD 88)

FIELD DATA				LABORATORY DATA									
Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Organic Content (%)	Soil Type	Description
▽			0.0 (P)	0.11 t=1.0	241 392	70	130	35	95		16.4		Very Soft dark gray ORGANIC CLAY (OH) w/ organic material
			0.0 (P)	0.10 t=2.0	84 233	95	71	22	49	72	35.8		
	5		0.0 (P)	0.09 t=2.0	43 149 210	83	136	35	101		13.8		w/ silty sand seams
			WOH b/f		50					53			Very Loose gray Sandy LEAN CLAY (CL) (6.5 - 8 ft. Hydro = 47.3% Sand / 30.9% Silt / 21.8% Clay)
	10		14 b/f 5-8-6		29					39			Medium Dense gray CLAYEY SAND (SC)
			2 b/f 0-1-1		52					70			Very Soft gray SANDY CLAY (CL) (10.5 - 12 ft. Hydro = 30.3% Sand / 39.9% Silt / 29.8% Clay)
			0.25 (P)	0.16 t=6.0	82	94	70	23	47				
			0.25 (P)	0.21 t=6.0	83 46	95 102							Very Soft gray CLAY (CH)
	15			0.15 t=6.0	43 29	112 111	43	16	27	71 31			Loose gray CLAYEY SAND (SC) w/ silt & clay pockets
			13 b/f 1-1-12		51 30					43			
			0.25 (P)		30					37			
	20				39	105							
			0.5 (P)		29					36			(23 - 25 ft. Hydro = 63.6% Sand / 24.1% Silt / 12.3% Clay)
	25				57	104							
			0.25 (P)										
	30				32	87							
			0.25 (P)	0.32 t=14.0	64	101	73	23	50				Soft gray CLAY (CH) w/ silt seams
	35				64	99							
			20 b/f 7-9-11		29					20			Medium Dense gray SILTY SAND (SM) w/ trace clay
	40												Boring completed at 40 ft.

Ground Water Level Data

▽ Boring Conducted in Water

Boring Advancement Method

Wash borehole full depth:
0 to 40 ft.

Boring Abandonment Method

Borehole grouted with cement/ bentonite upon completion

Notes

t = Lateral Confining Pressure (psi).

Strata Boundaries May Not Be Exact

ARD LOG01R - NAPOLEON 17-84-2810.GPJ LOG01.GDT 8/15/17

Figure No. A.1-2

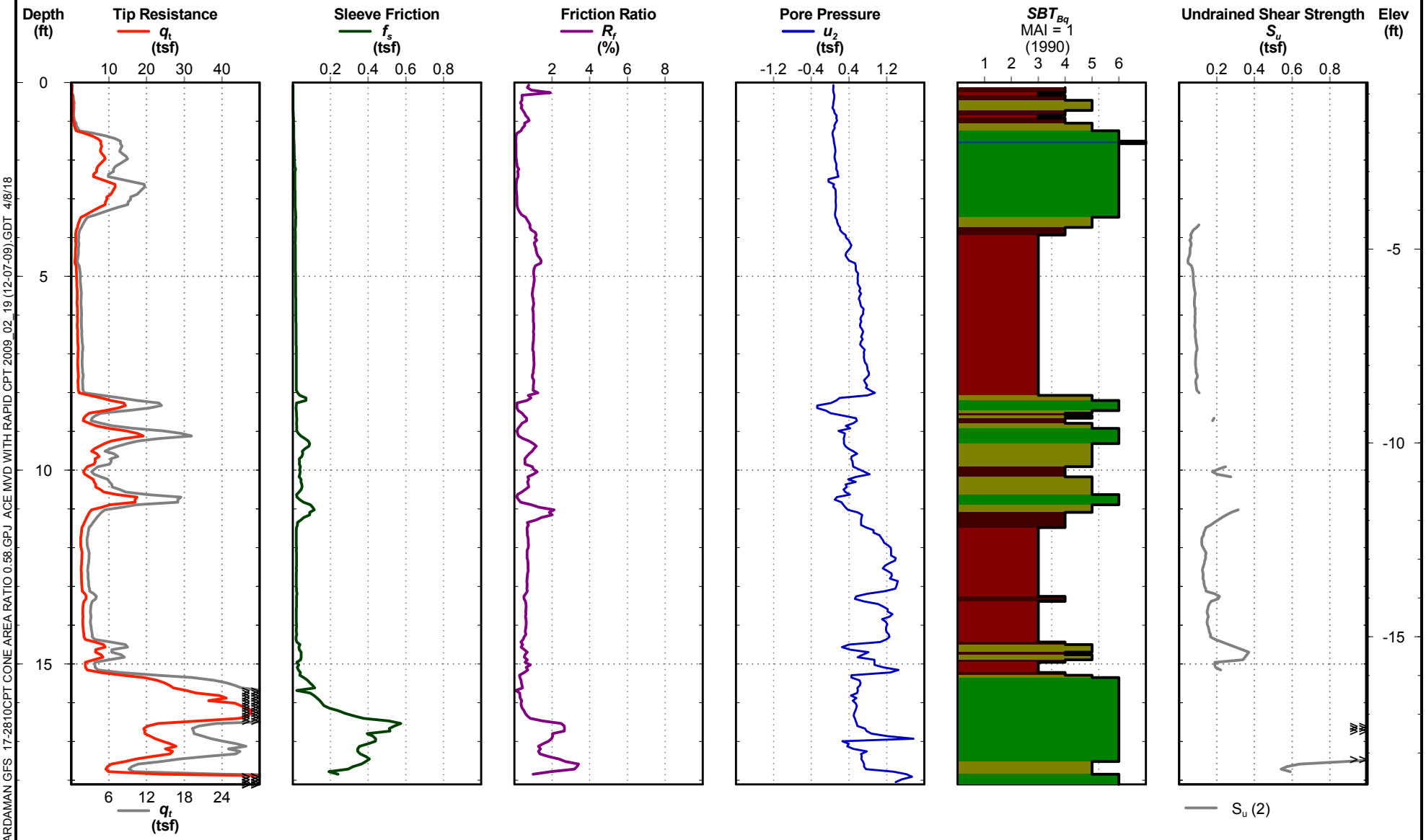
Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test

CPT-28

Date: Jul. 5, 2017
Operator: J. Porter
Northing: 3660661.00
Easting: 233622.00
Mudline Elevation: -0.7 ft. NAVD88
Total Depth: 18.11 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-28

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-1

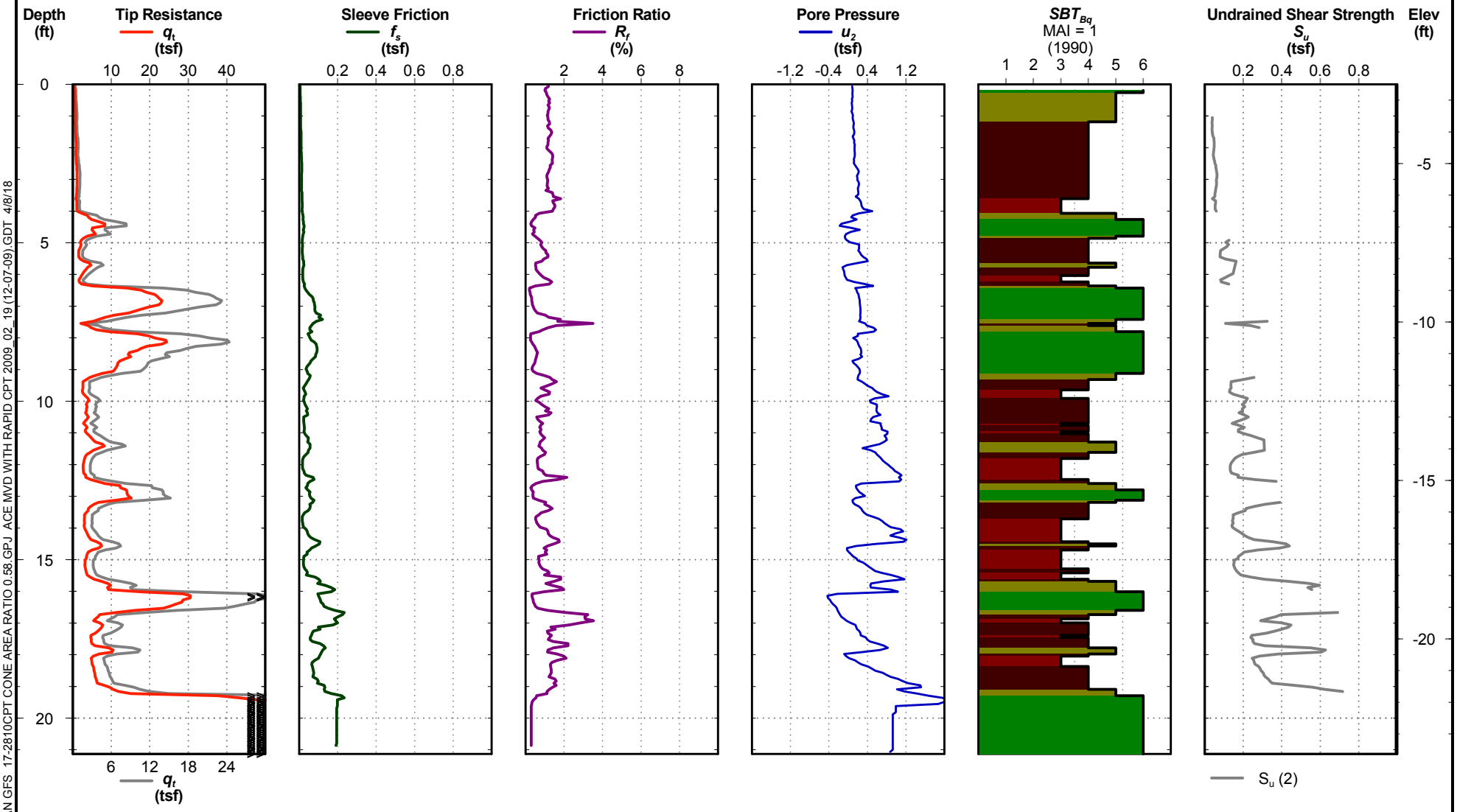
Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test

CPT-29

Date: Jul. 11, 2017
Operator: J. Porter
Northing: 3661754.00
Easting: 234497.00
Mudline Elevation: -2.5 ft. NAVD88
Total Depth: 21.13 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-29

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

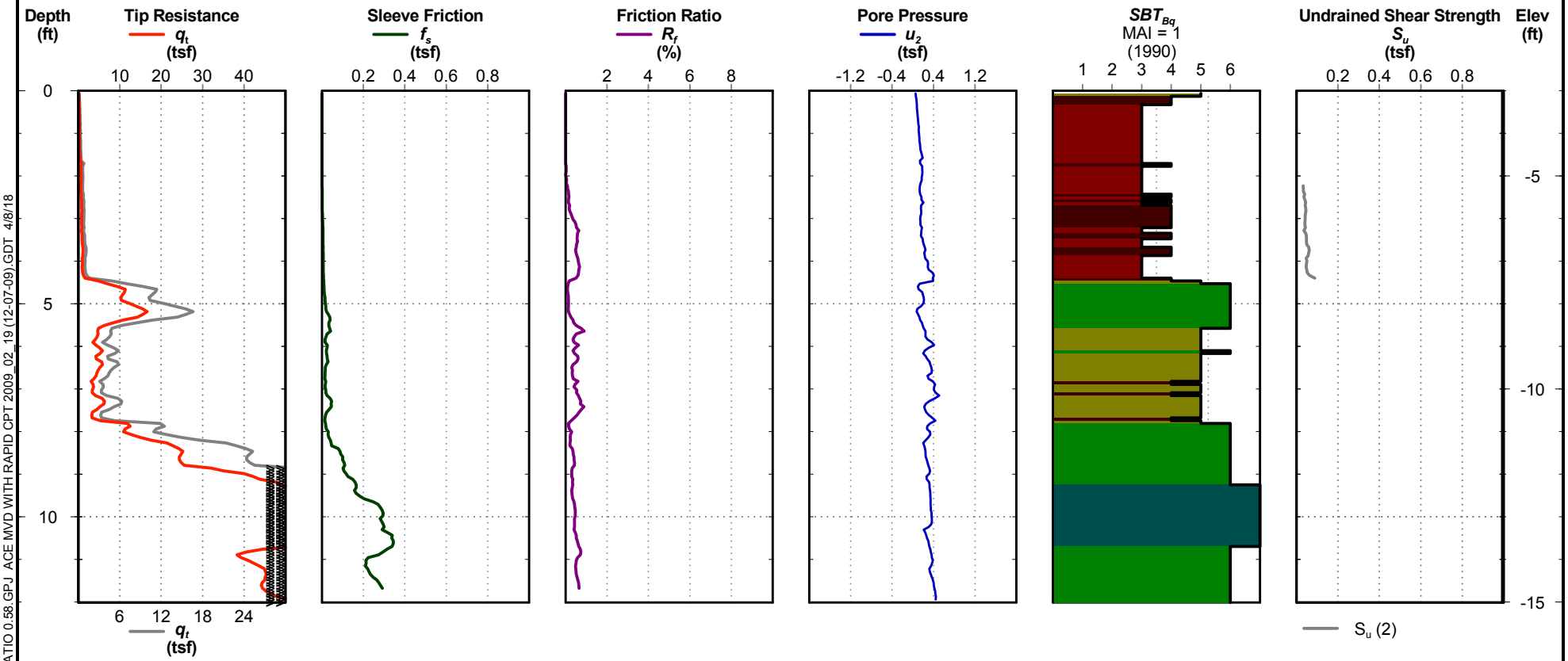
Figure No. A.2-2

Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test — CPT-30A

Date: Jul. 6, 2017
Operator: J. Porter
Northing: 3663073.00
Easting: 235387.00
Mudline Elevation: -3 ft. NAVD88
Total Depth: 12.01 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-30A

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-3

Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

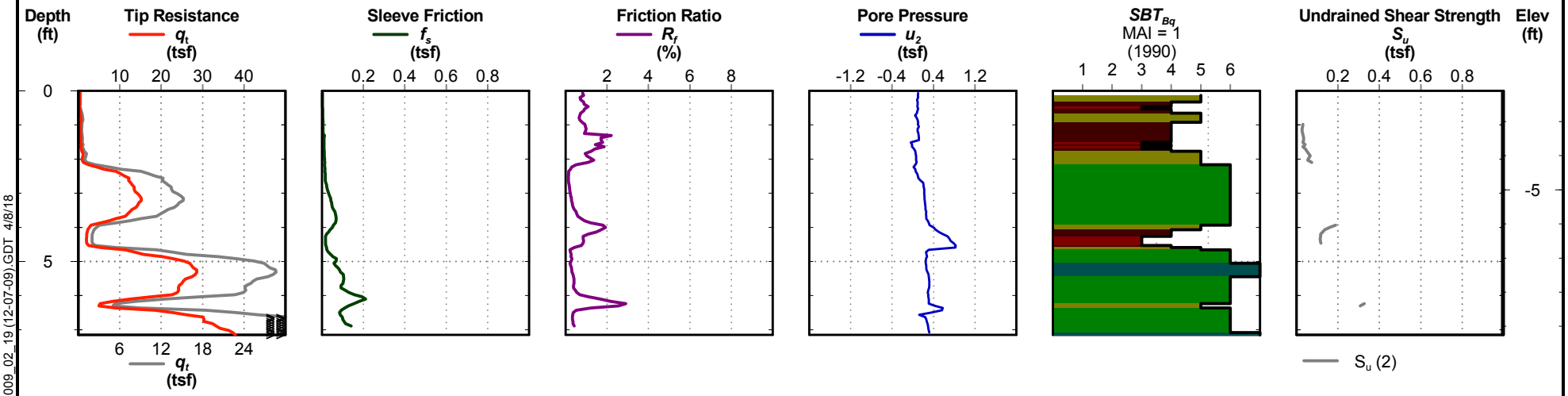
Cone Penetration Test

CPT-31

Date: Jul. 11, 2017
Operator: J. Porter

Northing: 3664469.00
Easting: 236468.00

Mudline Elevation: -2.1 ft. NAVD88
Total Depth: 7.15 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-31

Figure No. A.2-4

Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

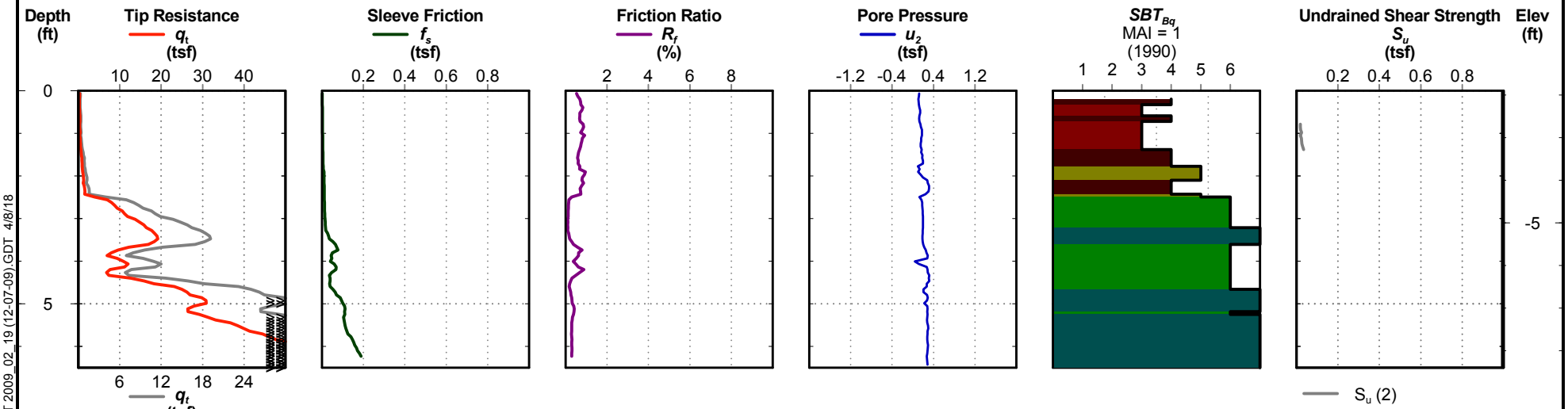
Cone Penetration Test

CPT-32

Date: Jul. 6, 2017
Operator: J. Porter

Northing: 3665951.00
Easting: 237605.00

Mudline Elevation: -1.9 ft. NAVD88
Total Depth: 6.5 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-32

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-5

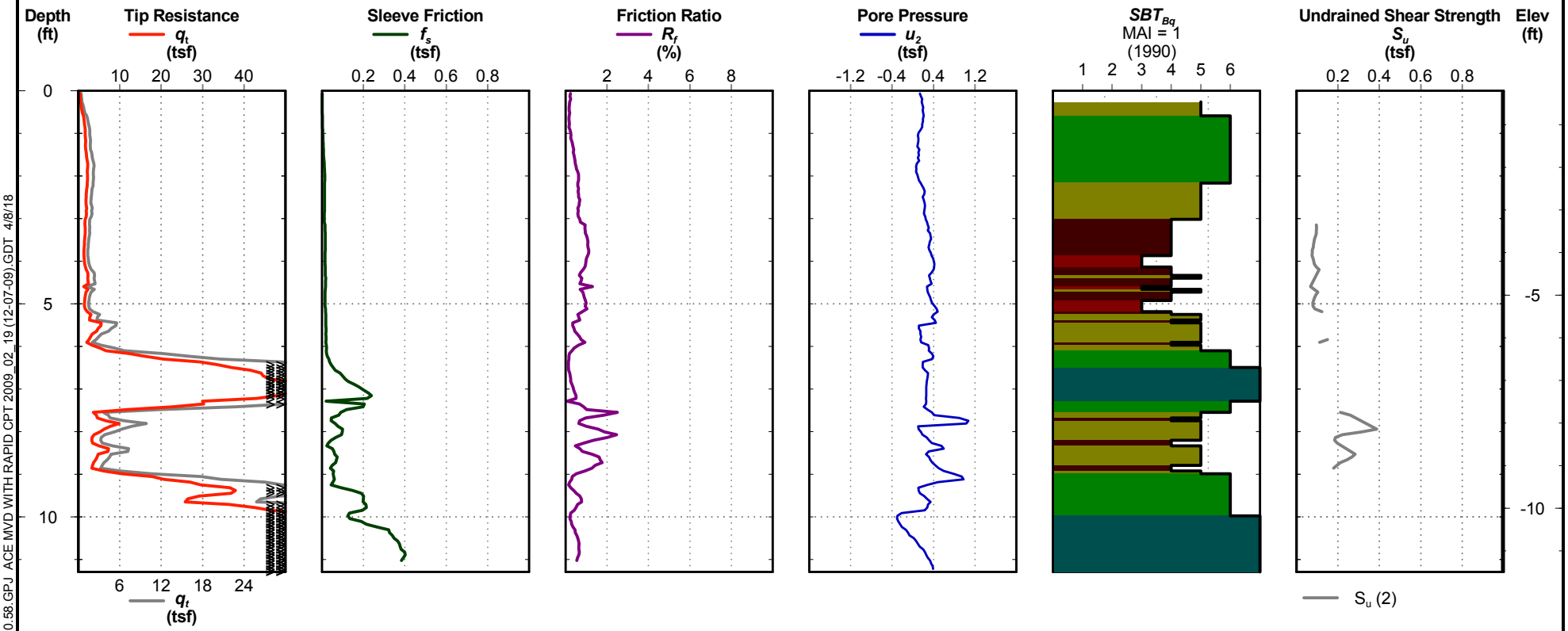
Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test

CPT-33

Date: Jul. 6, 2017
Operator: J. Porter
Northing: 3668913.00
Easting: 239993.00
Mudline Elevation: -0.2 ft. NAVD88
Total Depth: 11.29 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-33

Figure No. A.2-6

Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

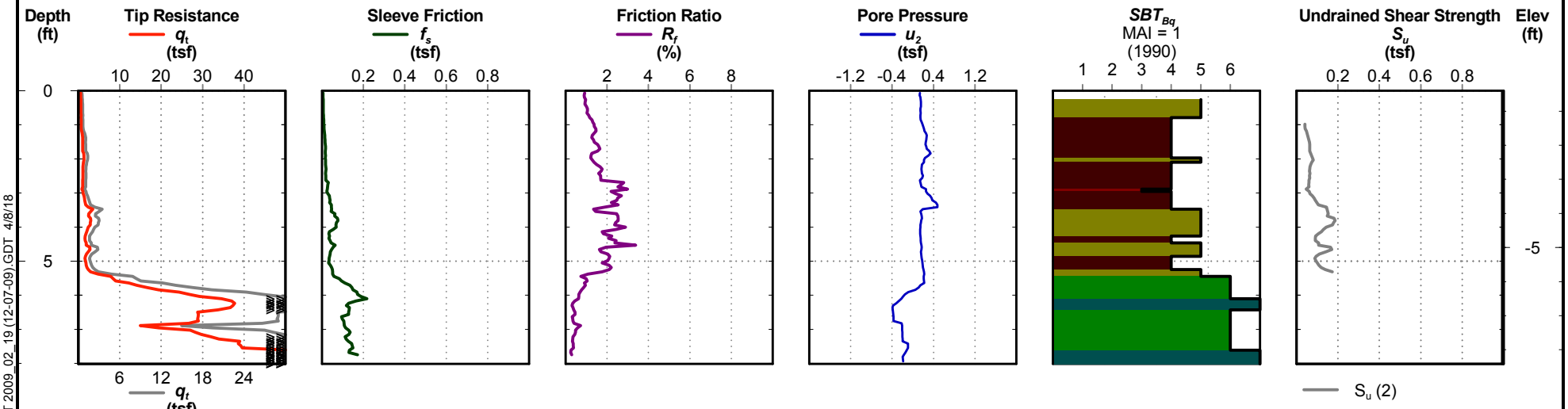
Cone Penetration Test

CPT-34

Date: Jul. 11, 2017
Operator: J. Porter

Northing: 3670870.00
Easting: 241562.00

Mudline Elevation: -0.4 ft. NAVD88
Total Depth: 8.01 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

Page 1 of 1

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-34

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-7

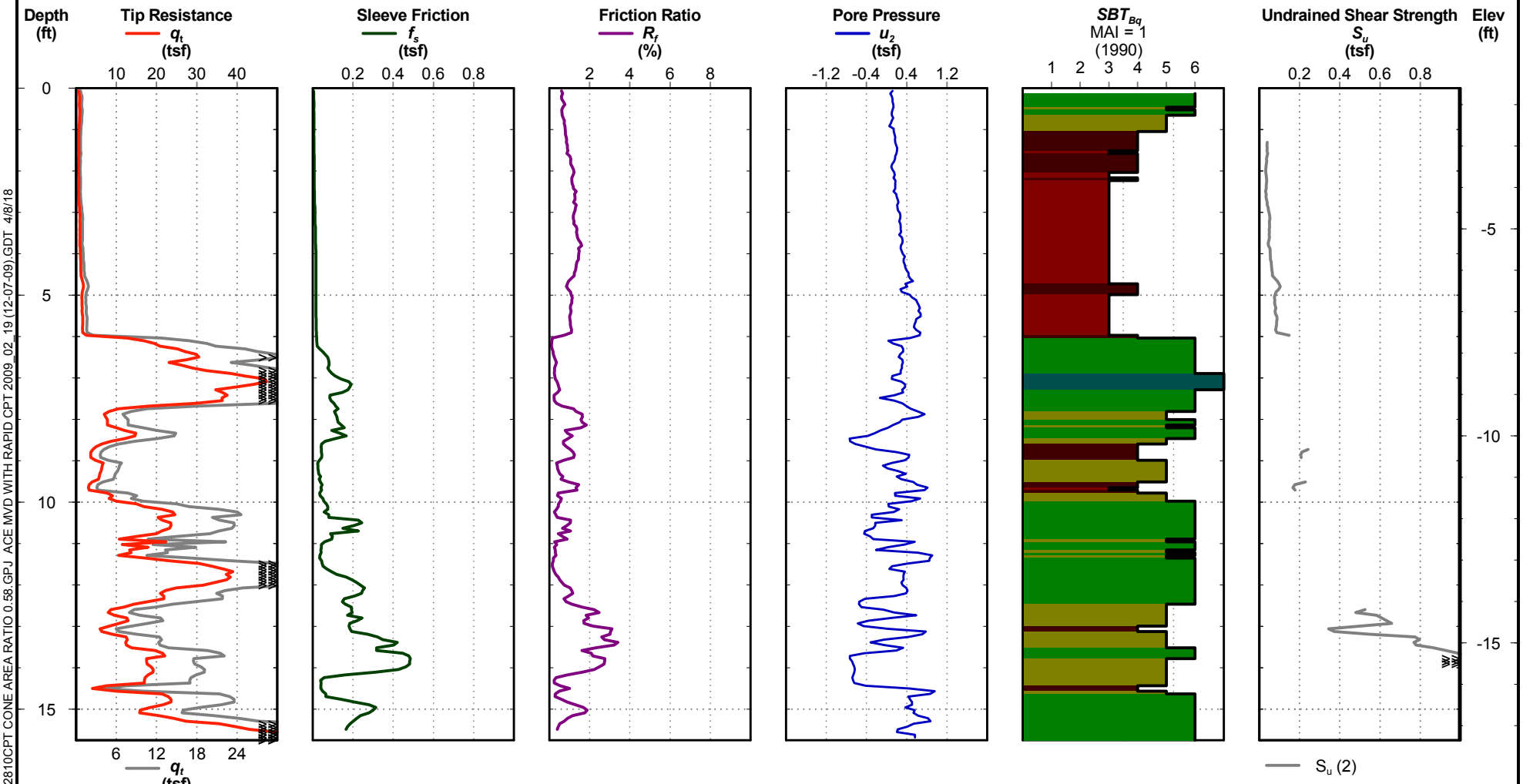
Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test

CPT-35

Date: Jul. 6, 2017
Operator: J. Porter
Northing: 3672529.00
Easting: 242540.00
Mudline Elevation: -1.6 ft. NAVD88
Total Depth: 15.75 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

Page 1 of 1

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-35

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-8

Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

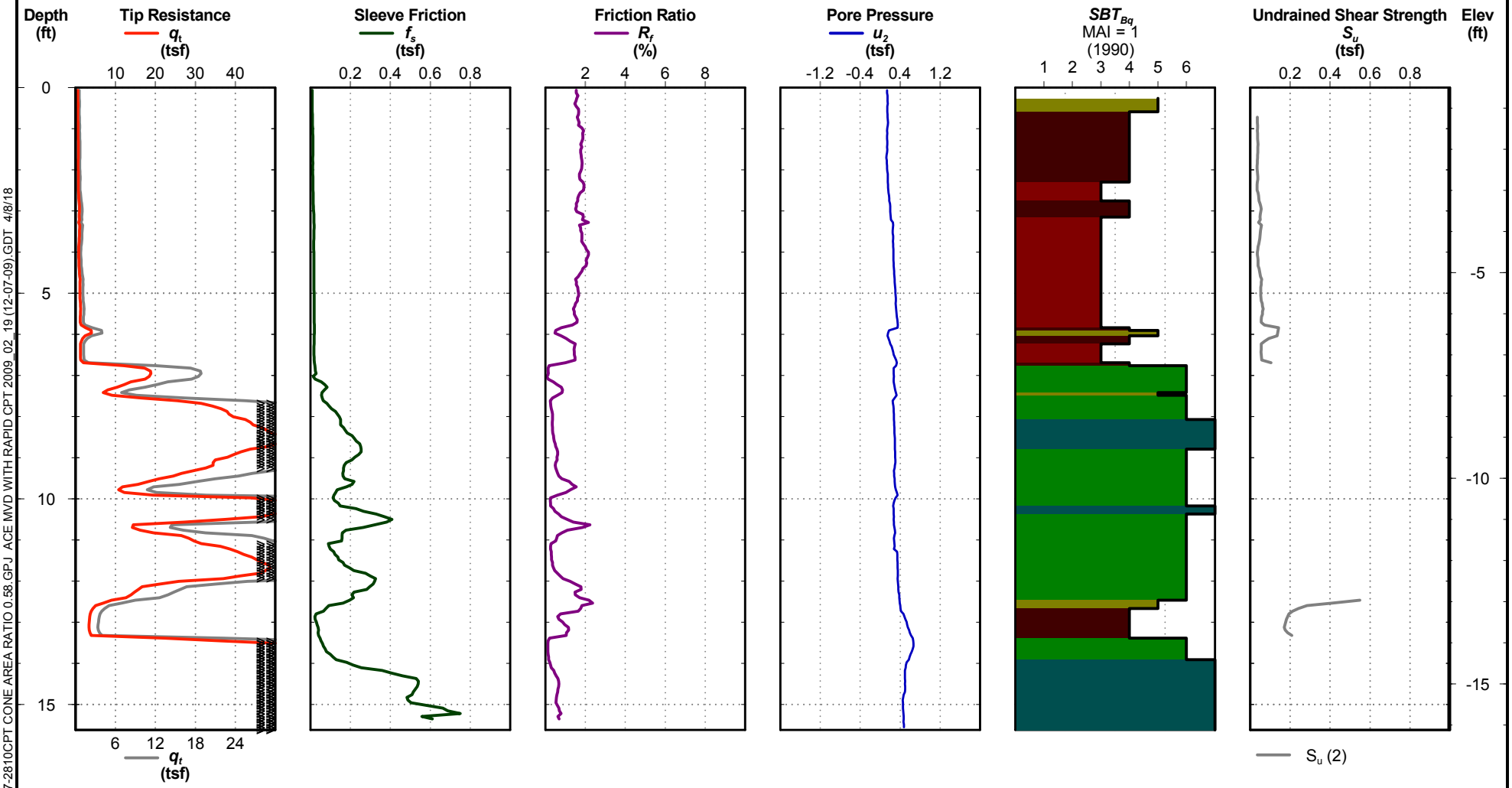
Cone Penetration Test

CPT-37

Date: Jul. 6, 2017
Operator: J. Porter

Northing: 3675693.00
Easting: 244836.00

Mudline Elevation: -0.5 ft. NAVD88
Total Depth: 15.62 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-37

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-9

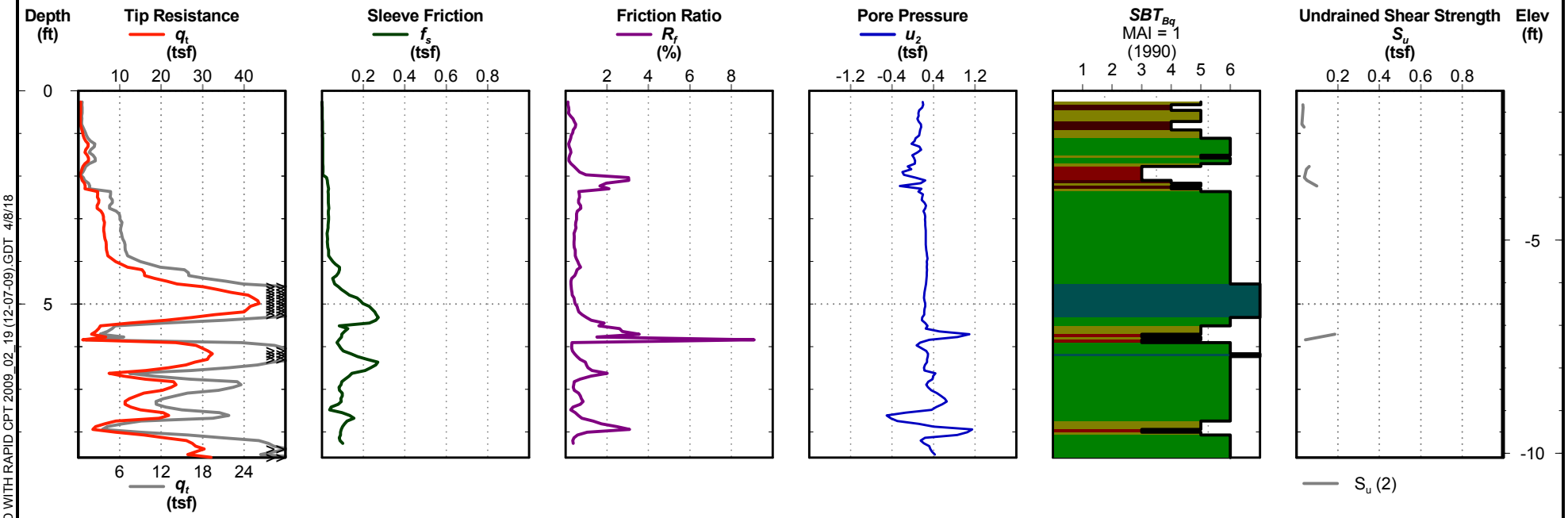
Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test

CPT-48

Date: Mar. 19, 2018
Operator: J. Porter
Northing: 3678206.00
Easting: 246759.00
Mudline Elevation: -1.5 ft. NAVD88
Total Depth: 8.6 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-48

Figure No. A.2-10

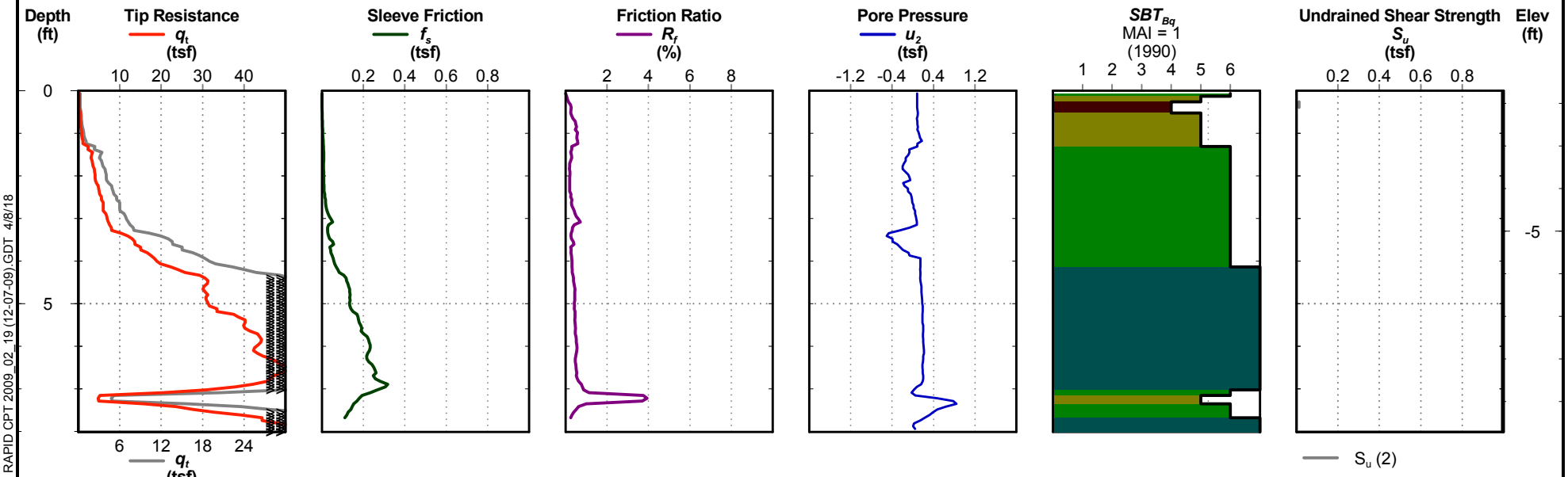
Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test

CPT-50

Date: Mar. 19, 2018
Operator: J. Porter
Northing: 3679722.00
Easting: 247984.00
Mudline Elevation: -1.7 ft. NAVD88
Total Depth: 8.01 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

Page 1 of 1

1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/Nkt
Nkt = 15

CPT-50

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-11

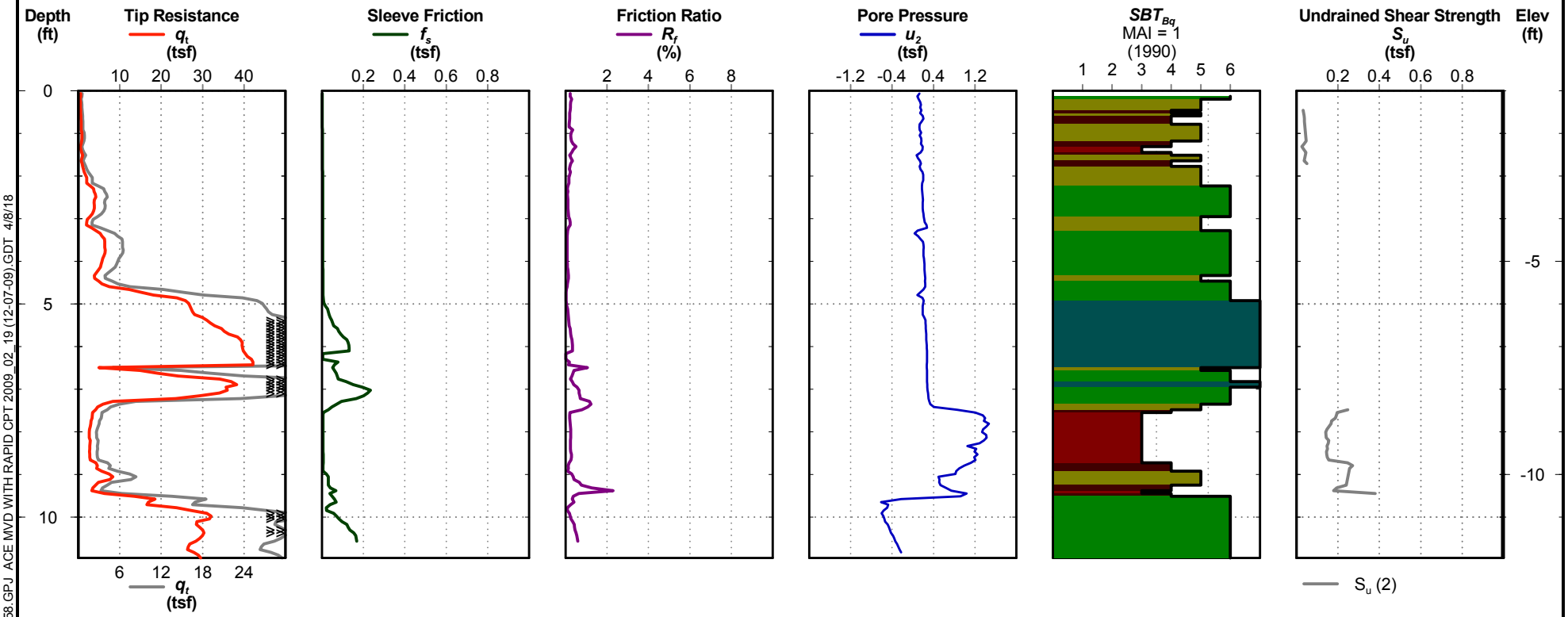
Ardaman & Associates, Inc.

Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)
(Louisiana)

Cone Penetration Test

CPT-53

Date: Mar. 19, 2018
Operator: J. Porter
Northing: 3682785.00
Easting: 250319.00
Mudline Elevation: -1 ft. NAVD88
Total Depth: 10.96 ft.



Notes:
-Soil Behavior Type (SBT) was determined using the friction ratio classification chart.
-Test performed in general accordance with ASTM D5778-07

Page 1 of 1

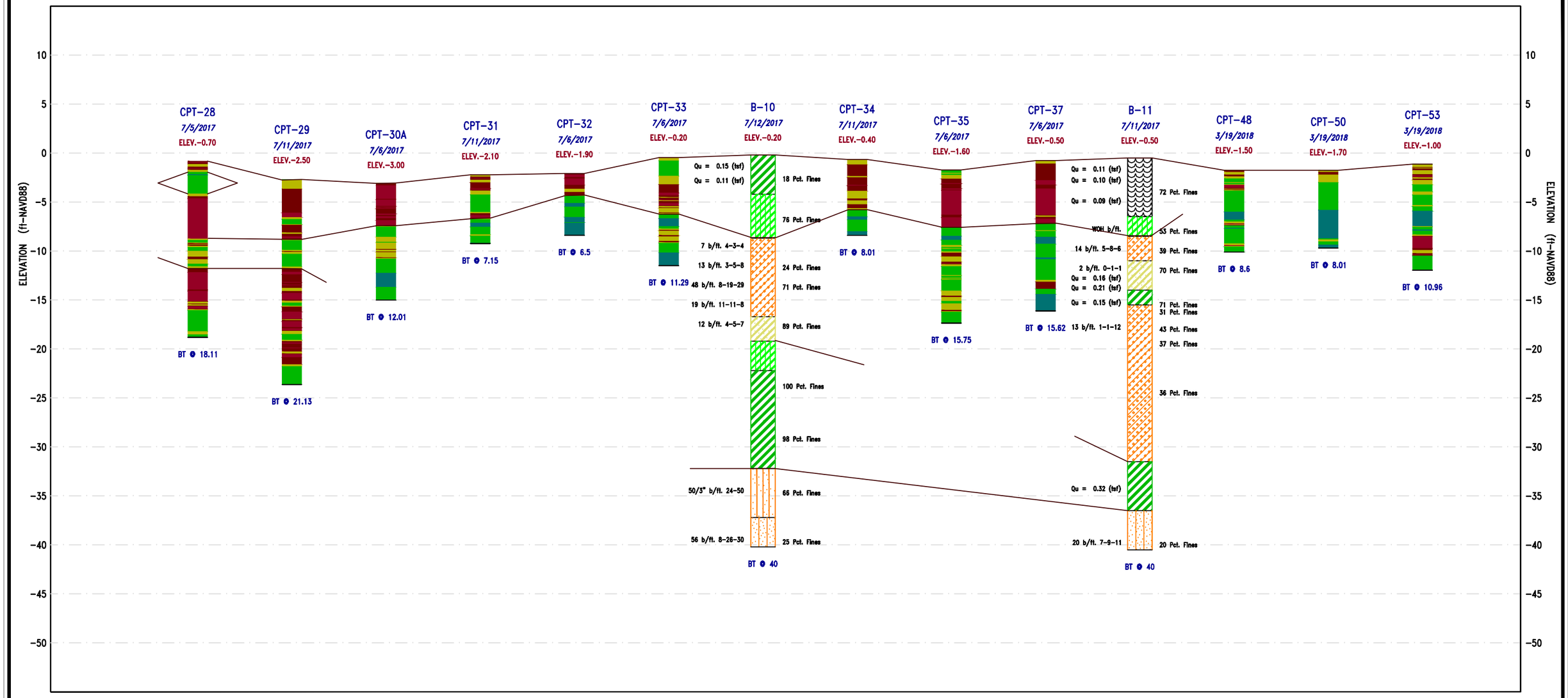
1 - Sensitive, fine grained
2 - Organic soils - clay
3 - Clays - silty clay to clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to dense sand
8 - Very stiff sand to clayey sand *
9 - Very stiff, fine grained *

Su (2) = (qt - total vertical stress)/NktS
Nkt = 15

CPT-53

CPT REPORT - ARDAMAN GFS 17-2810CPT CONE AREA RATIO 0.58.GPJ ACE MVD WITH RAPID CPT 2009_02_19 (12-07-09).GDT 4/8/18

Figure No. A.2-12



CPT MATERIAL GRAPHICS

- sensitive fine grained
- organic material
- clay
- silty clay to clay
- sandy silt to clayey silt
- sand to silty sand
- gravelly sand to sand
- very stiff fine grained (*)
- sand to clayey sand (*)

Robertson et al (1990) Qt vs Fr – MAI = 1

LITHOLOGY GRAPHICS

- USCS High Plasticity Clay
- USCS High Plasticity Organic silt or clay
- USCS Low Plasticity Clay
- USCS Peat
- USCS Low Plasticity Sandy Clay
- USCS Clayey Sand
- USCS Silt
- USCS Poorly-graded Sand
- USCS Sandy Silt
- USCS Silty Clay

SUBSURFACE PROFILE

PROJECT:
Caminada Headlands Back Barrier
Marsh Creation Increment II (BA-193)

LOCATION:
Jefferson & Lafourche Parishes, Louisiana

JOB NO:
17-2810

DATE:
4/2/2018

Ardaman & Associates, Inc.

Figure No. A.3

Appendix B. LABORATORY DATA PLOTS

This Appendix contains the following:

Co-Located Boring and CPT - Comparison for B-10

Moisture Content (%)
& Atterberg Limits

Undrained Shear Strength
(psf.)

Undrained Shear Strength
(psf.)

Wet Density
(pcf.)

Percent Fines
(%)

Elevation (ft.)

Nkt value = 15

Su = (qt - σvo)/Nkt

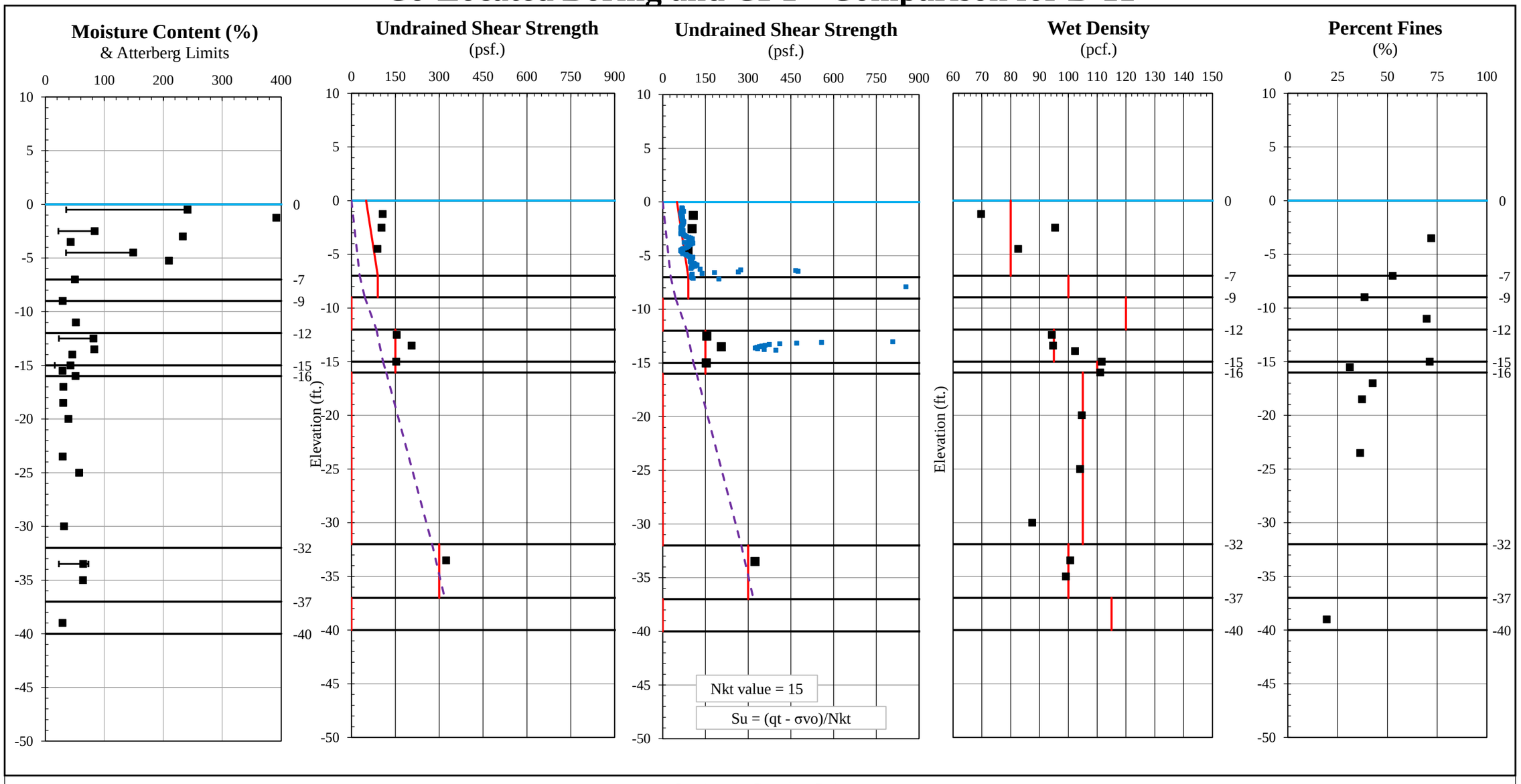
Stratigraphy Based on B-10

B-10 | CPT-33 | Strata | Water | Design | 0.23 c/p'

Figure No. B.1-1
BA-193 Caminada Headlands Back Barrier Marsh Creation Increment II
AAI No. 17-2810

Ardaman & Associates, Inc.

Co-Located Boring and CPT - Comparison for B-11

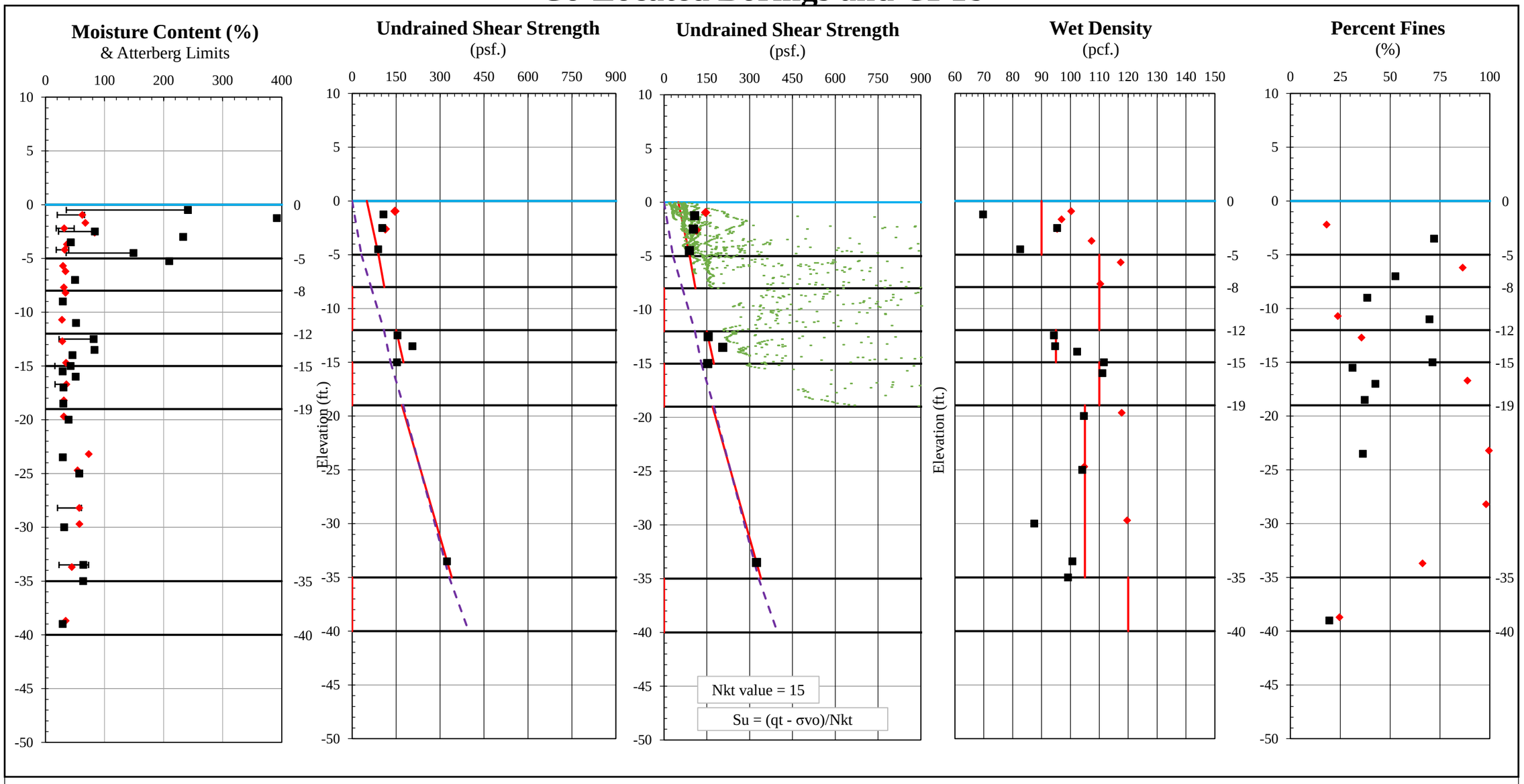


Stratigraphy Based on B-11

B-11 | CPT-37 | Strata | Water | Design | 0.23 c/p'

Figure No. B.1-2
BA-193 Caminada Headlands Back Barrier Marsh Creation Increment II
AAI No. 17-2810

Co-Located Borings and CPTs



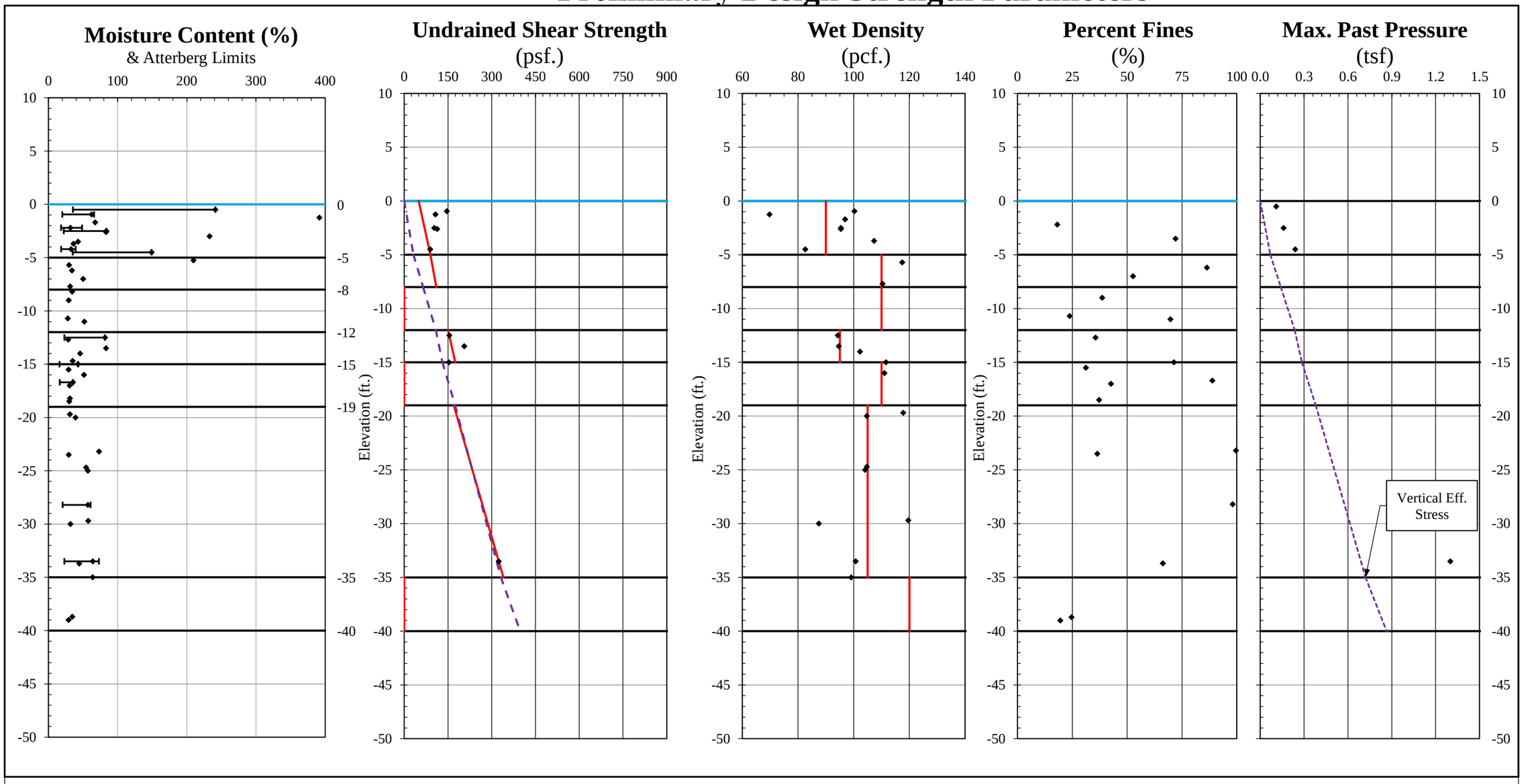
Stratigraphy Based an average of all the CPT data and Soil Borings

◇ B-10 □ B-11 ■ ALL CPT DATA — Strata — Water — Design - - - 0.23 c/p'

Ardaman & Associates, Inc.

Figure No. B.1-3
BA-193 Caminada Headlands Back Barrier Marsh Creation Increment II
AAI No. 17-2810

Preliminary Design Strength Parameters

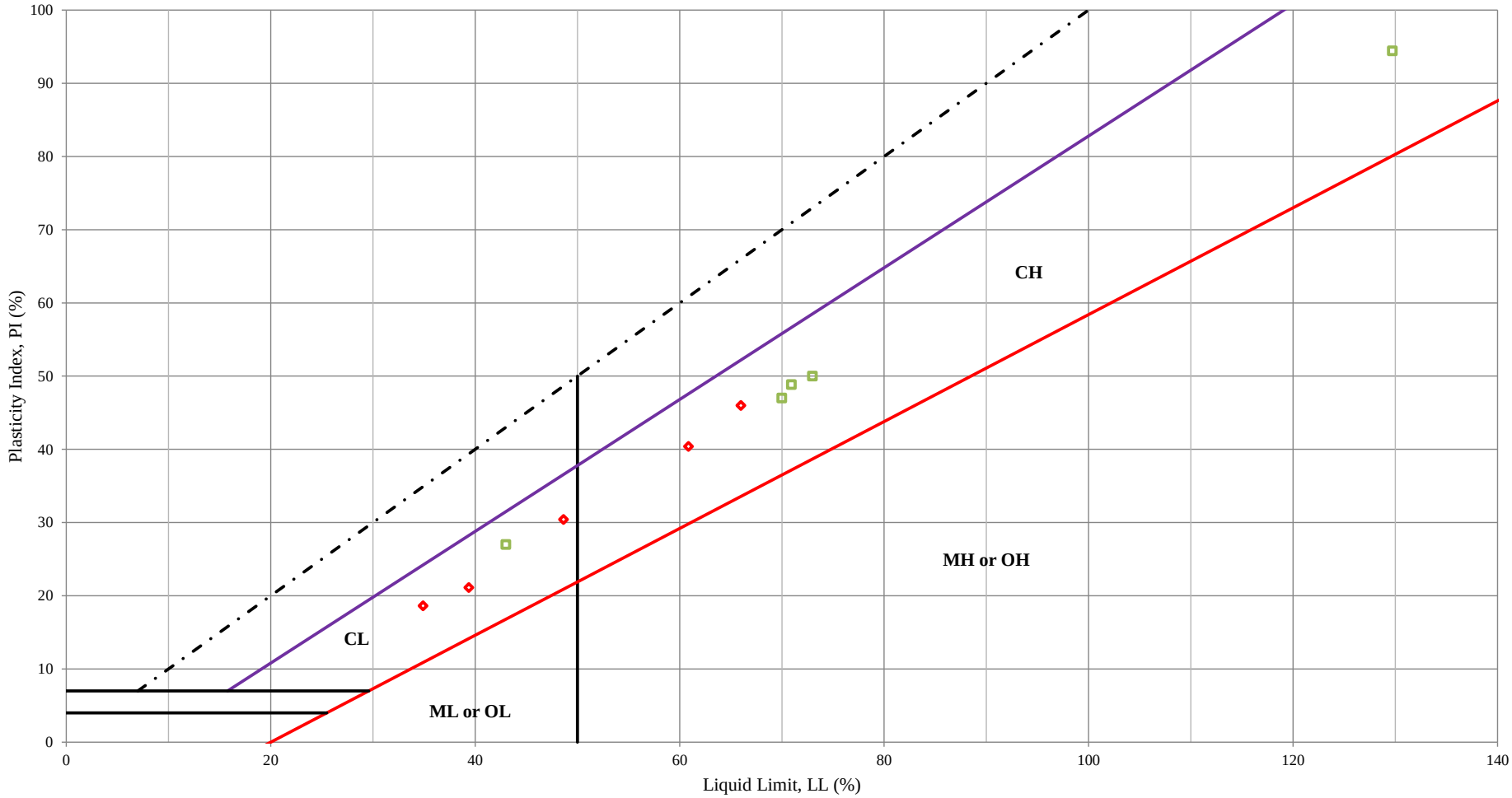


Stratigraphy Based on an average of all the CPR data and Soil Borings

◇ All Data — Strata — Water — Design — - - 0.23 c/p'

Figure No. B.1-4
BA-193 Caminada Headlands Back Barrier Marsh Creation Increment II
AAI No. 17-2810

Ardaman & Associates, Inc.



U-Line A-Line B-10 B-11

Ardaman & Associates, Inc.

Caminada Headlands Back Barrier Marsh Creation Increment II (BA-193)	
Draw By:	Date:
G.S.	8/8/2017
File No.	Figure No.
17-2810	n/a

Figure No. B.2

Plasticity and Liquidity Index

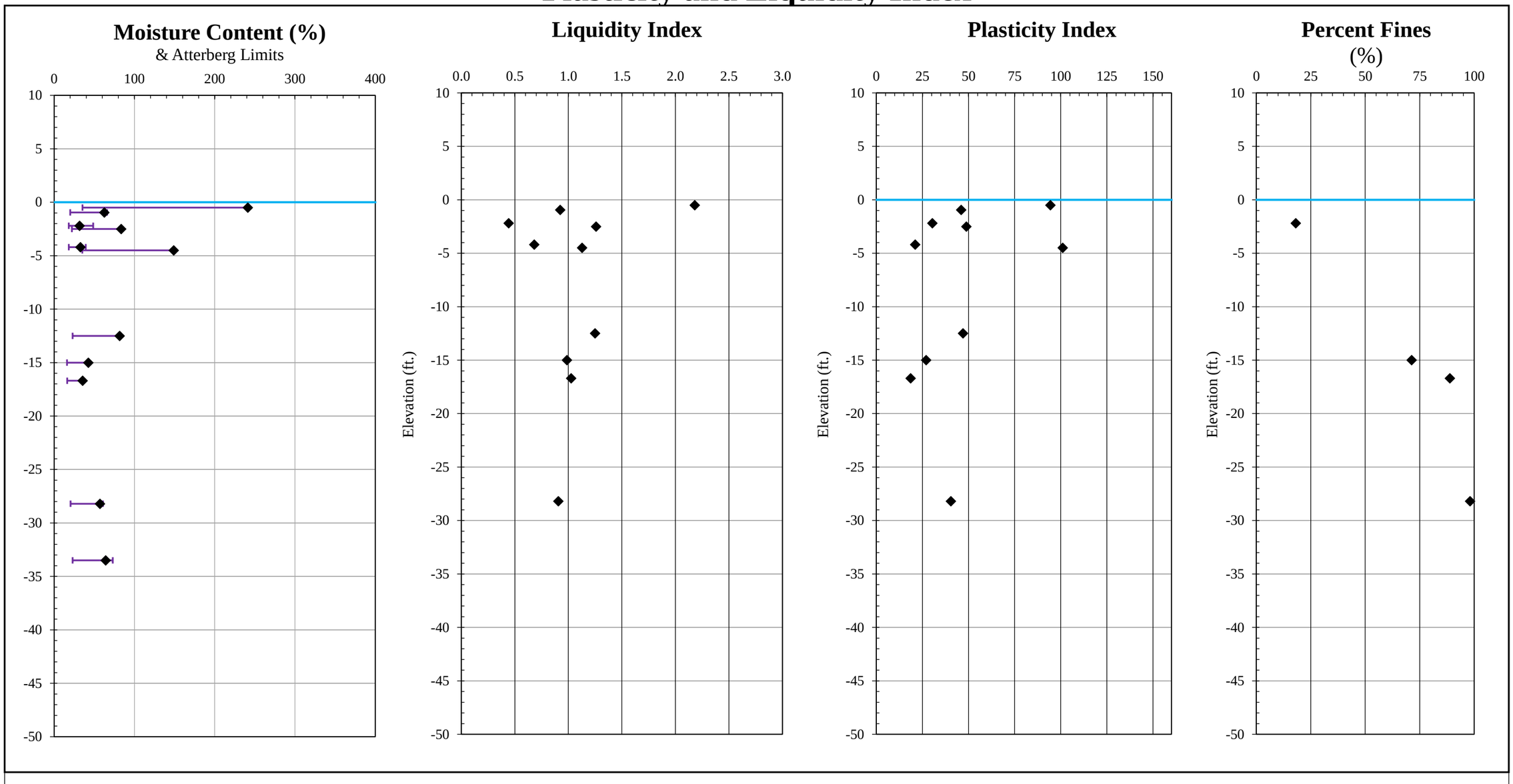
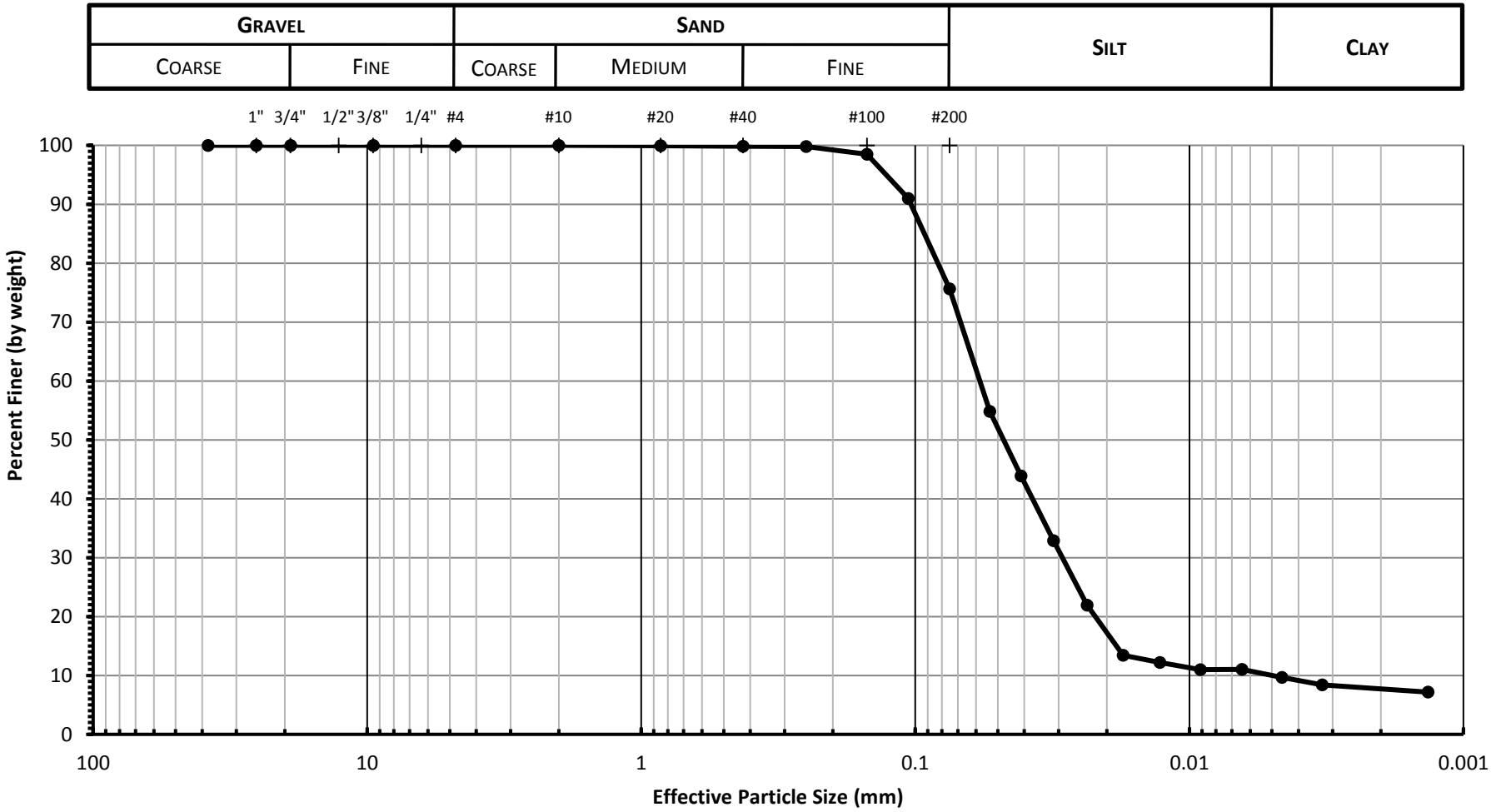


Figure No. B.3
BA-193 Caminada Headlands Back Barrier Marsh Creation Increment II
AAI No. 17-2810

Client: CPRA
Project: Caminada Back Barrier
AAI Project No.17-84-2810

PARTICLE SIZE ANALYSIS
(ASTM D422)

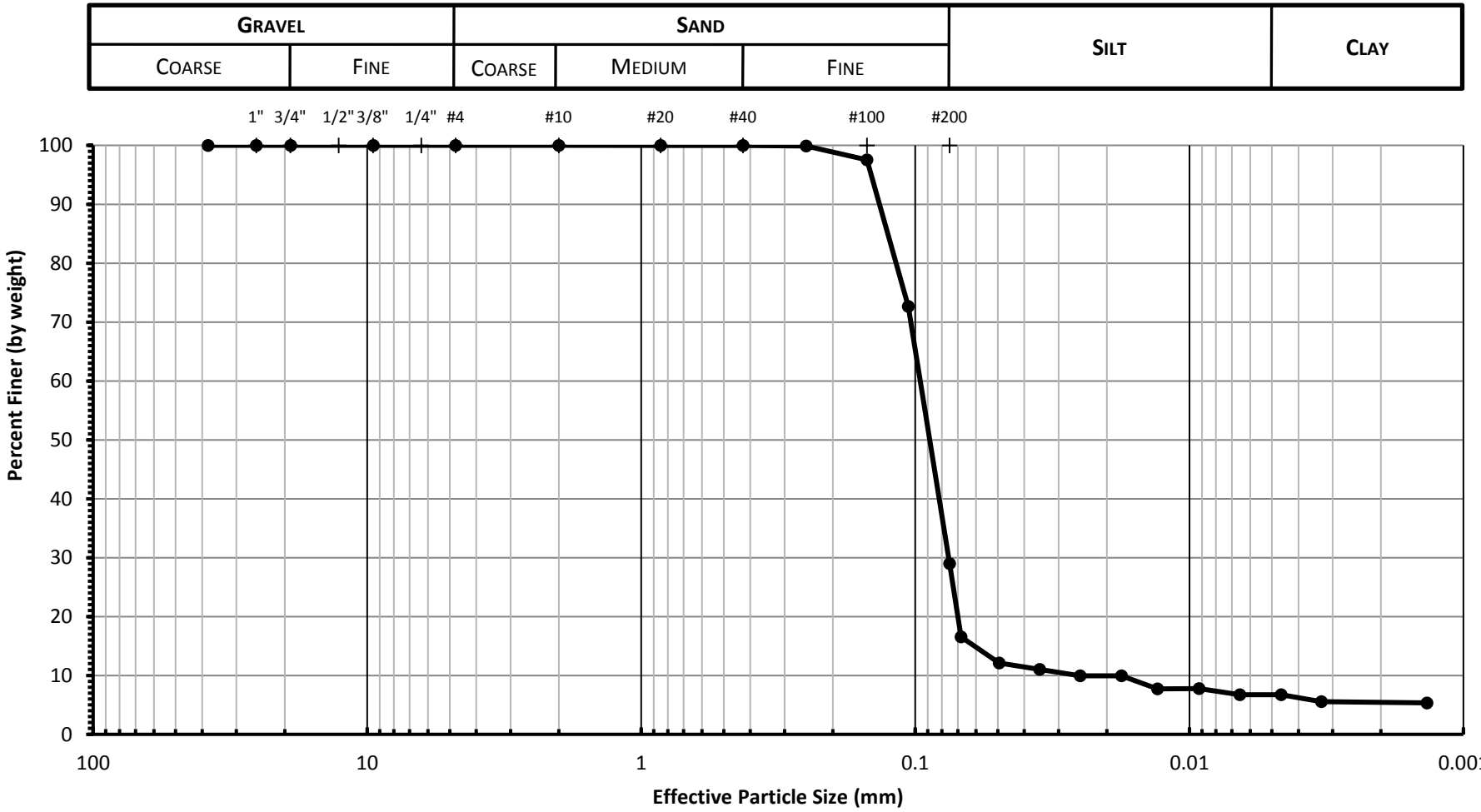


SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
BORING	DEPTH (FT)					
B-10	4-6'		0.0	24.4	65.7	10.0

Figure No. B.4-1

Client: CPRA
Project: Caminada Back Barrier
AAI Project No.17-84-2810

PARTICLE SIZE ANALYSIS
(ASTM D422)

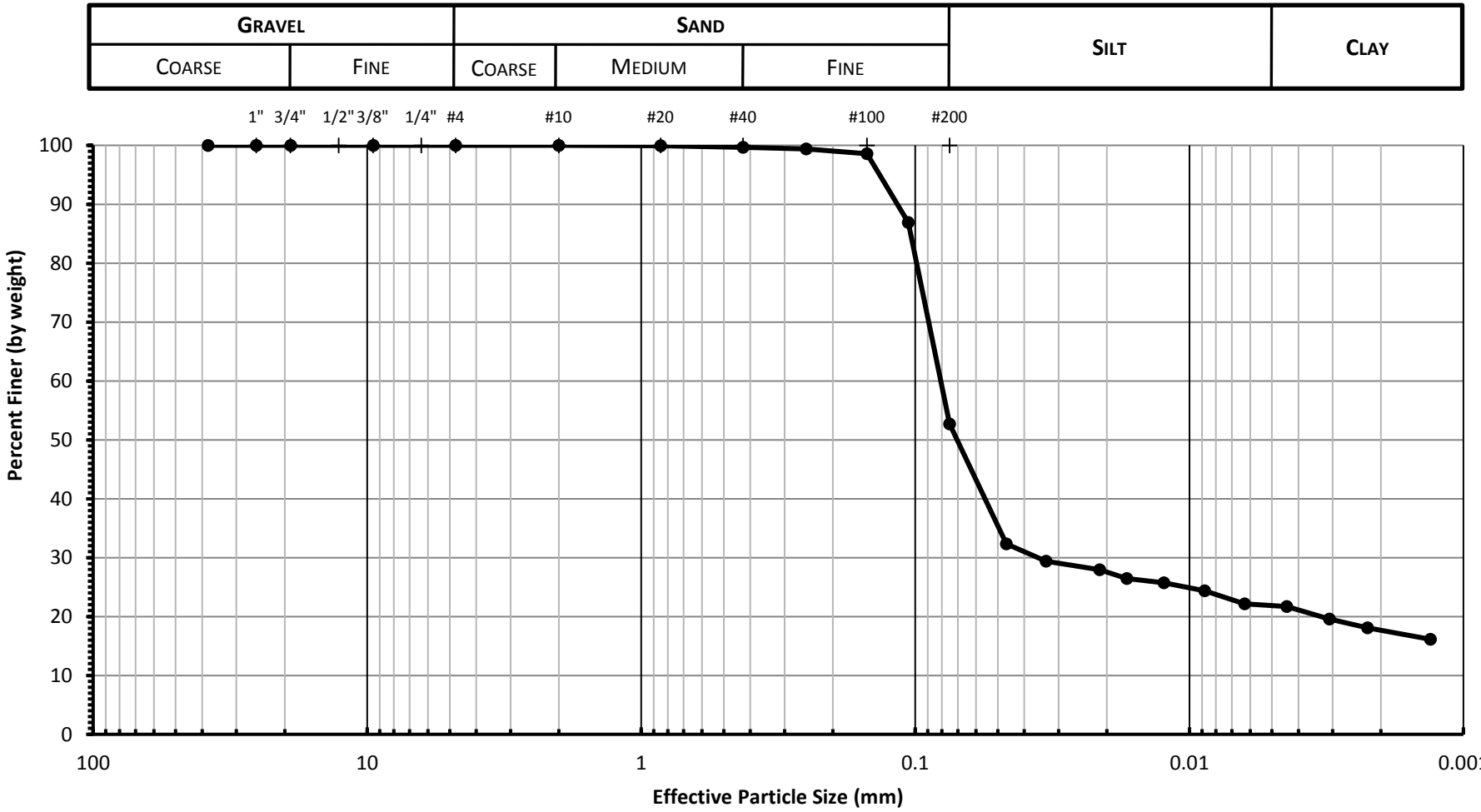


SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
BORING	DEPTH (FT)					
B-10	12-14'	sand, silt and little clay	0.0	71.0	22.3	6.7

Figure No. B.4-2

Client: CPRA
Project: Caminada Back Barrier
AAI Project No.17-84-2810

PARTICLE SIZE ANALYSIS
(ASTM D422)

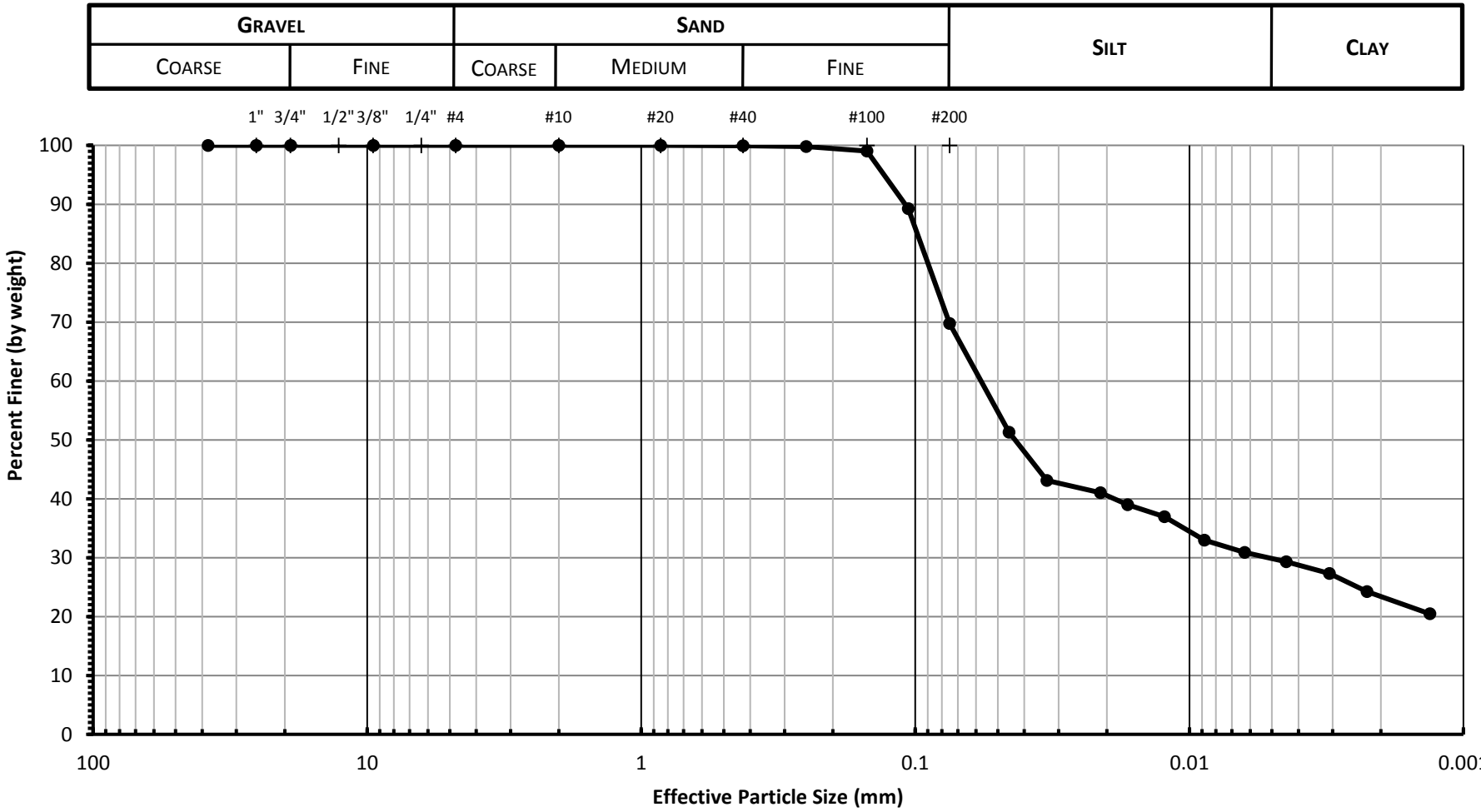


SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
BORING	DEPTH (FT)					
B-11	6.5-8	Gray SANDY LEAN CLAY (CL)	0.0	47.3	30.9	21.9

Figure No. B.4-3

Client: CPRA
Project: Cominada Back Barrier
AAI Project No.17-84-2810

PARTICLE SIZE ANALYSIS
(ASTM D422)

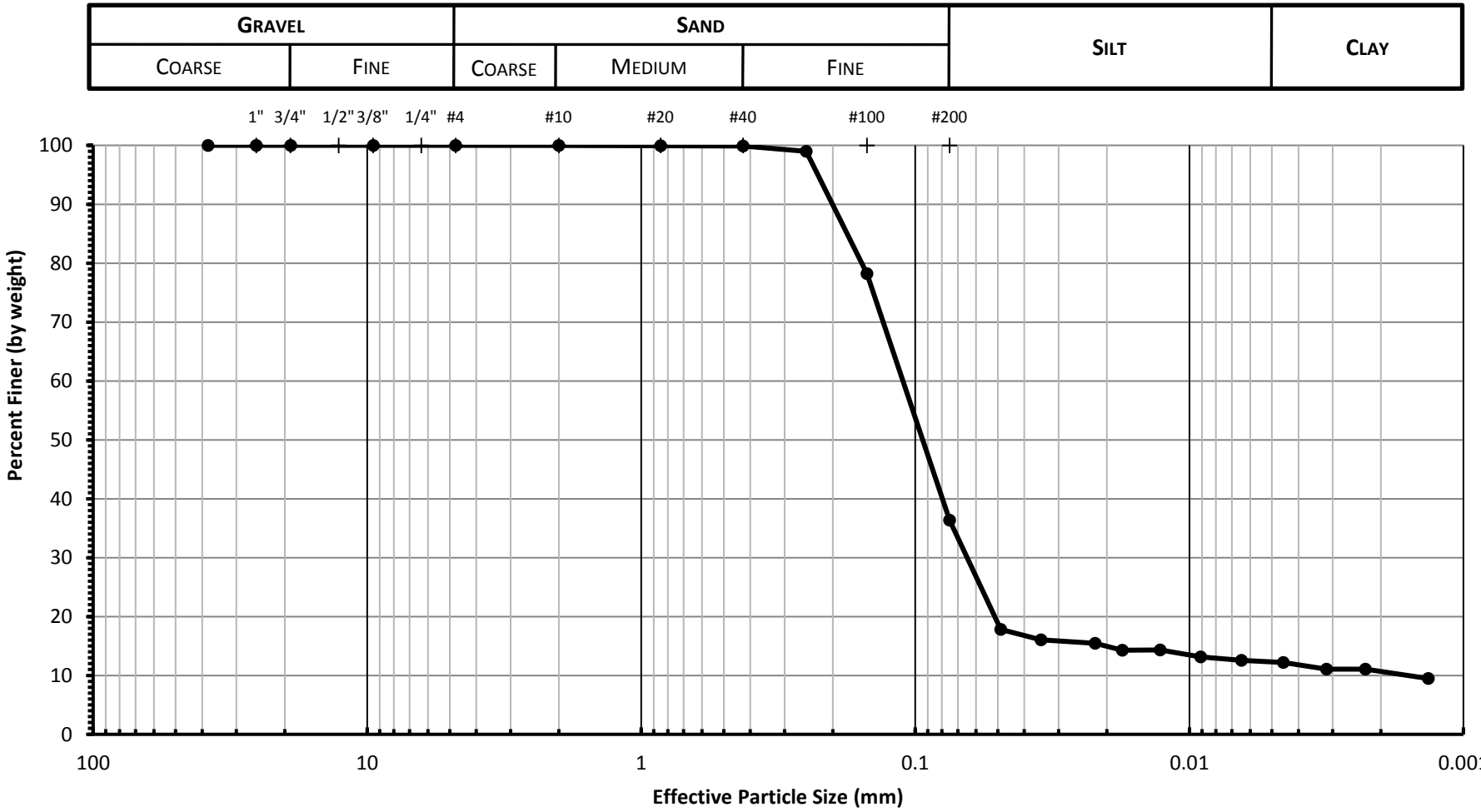


SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
BORING	DEPTH (FT)					
B-11	10.5-12	Gray SANDY LEAN CLAY (CL)	0.0	30.3	39.9	29.8

Figure No. B.4-4

Client: CPRA
Project: Cominada Back Barrier
AAI Project No.17-84-2810

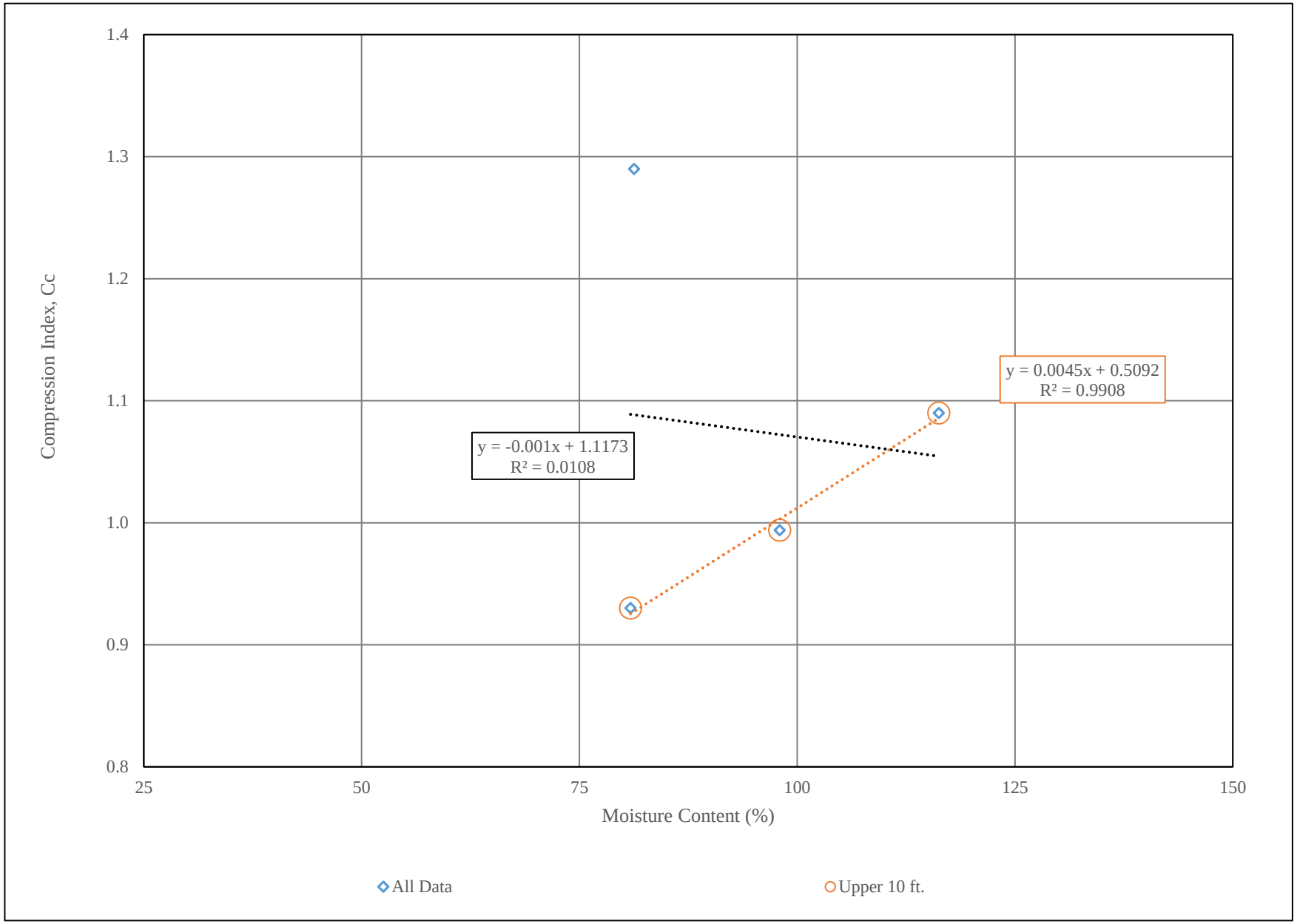
PARTICLE SIZE ANALYSIS
(ASTM D422)



SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
BORING	DEPTH (FT)					
B-11	23-25	Gray CLAYEY SAND (SC)	0.0	63.6	24.1	12.3

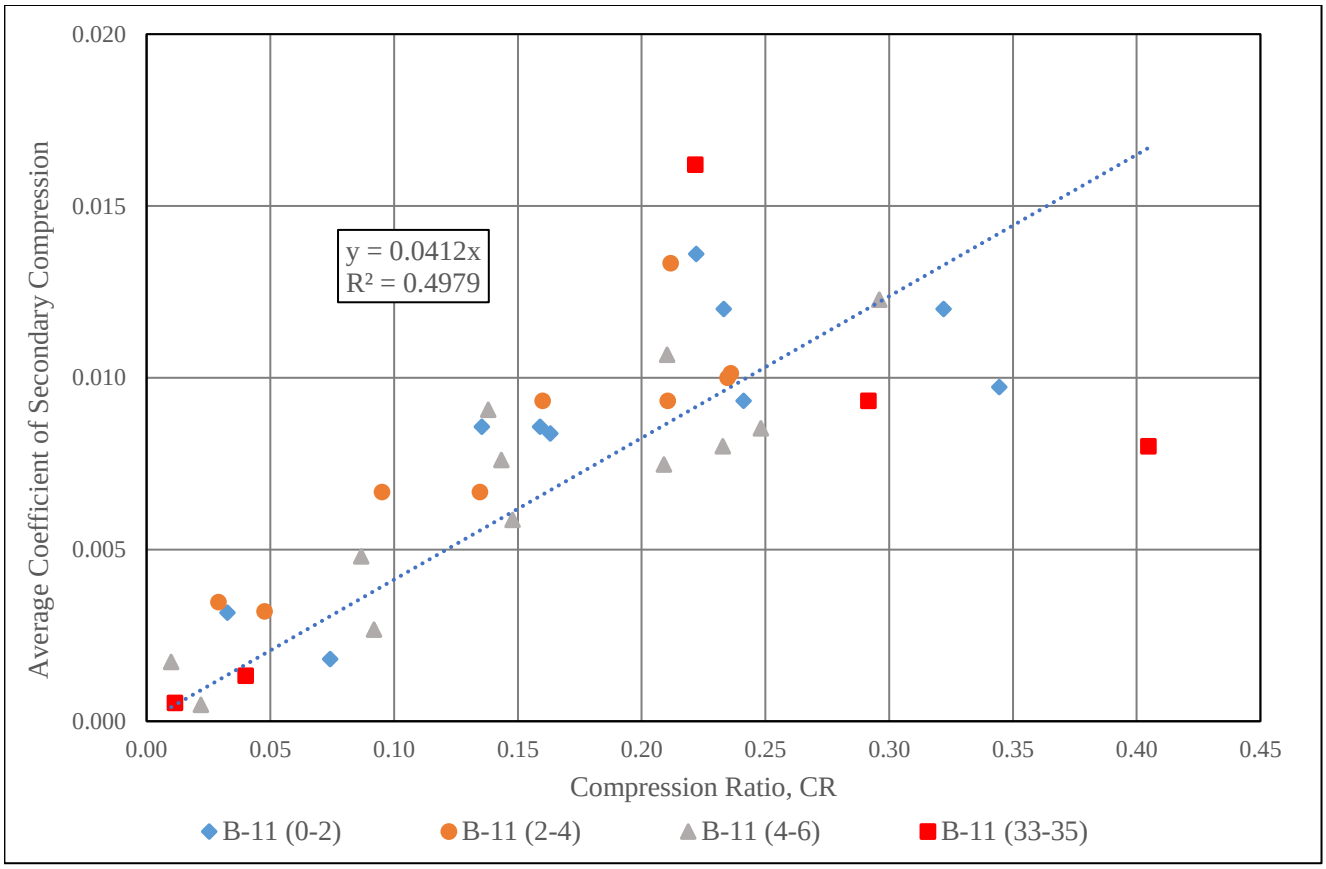
Figure No. B.4-5

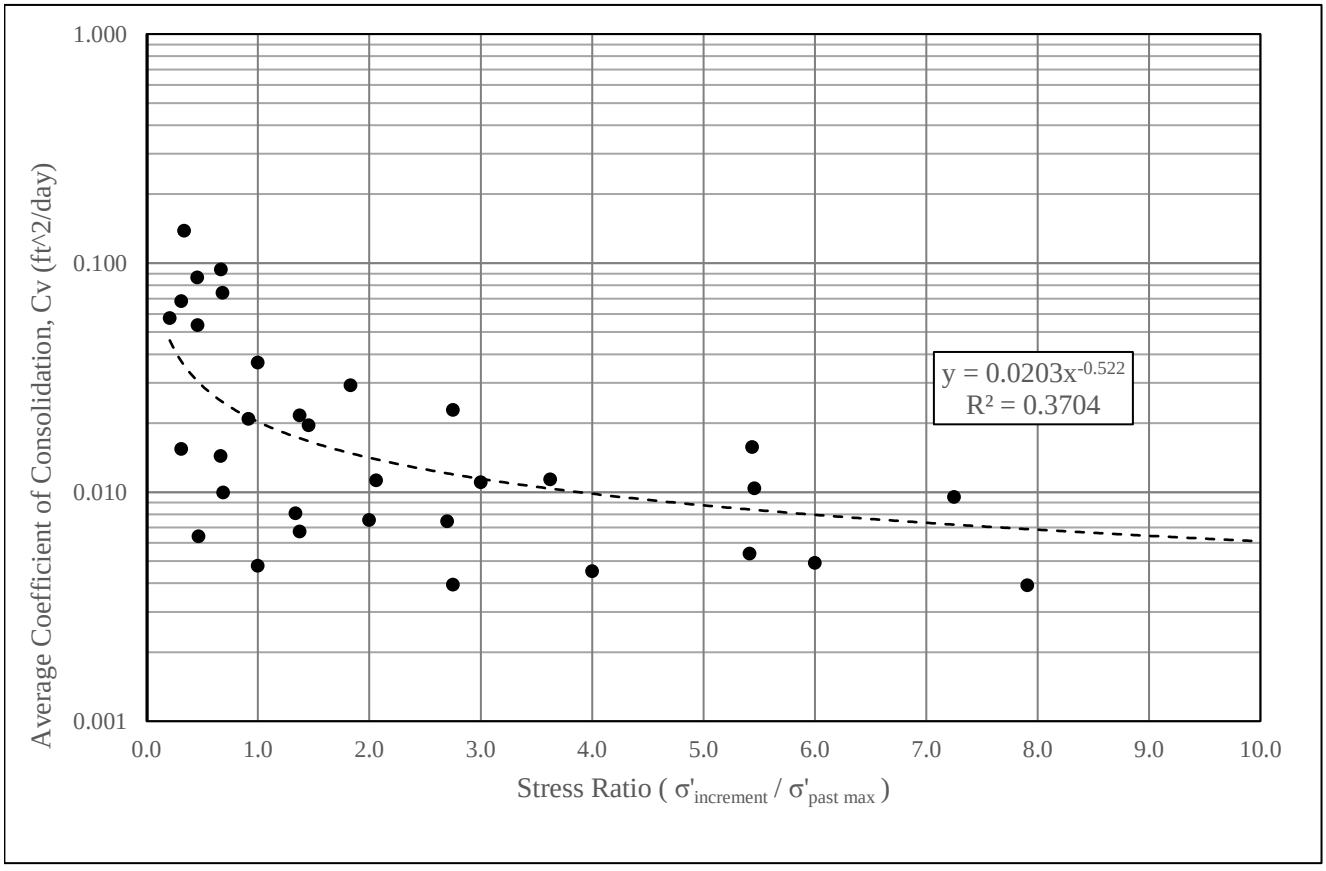
Caminada Back Barrier
(BA-193)



Ardaman & Associates, Inc.

Figure No. B.5
AAI No. 17-2810
Caminada Back Barrier (BA-193)





Ardaman & Associates, Inc.

Figure B.6
AAI No. 17-2810
Caminada Back Barrier (BA-193)

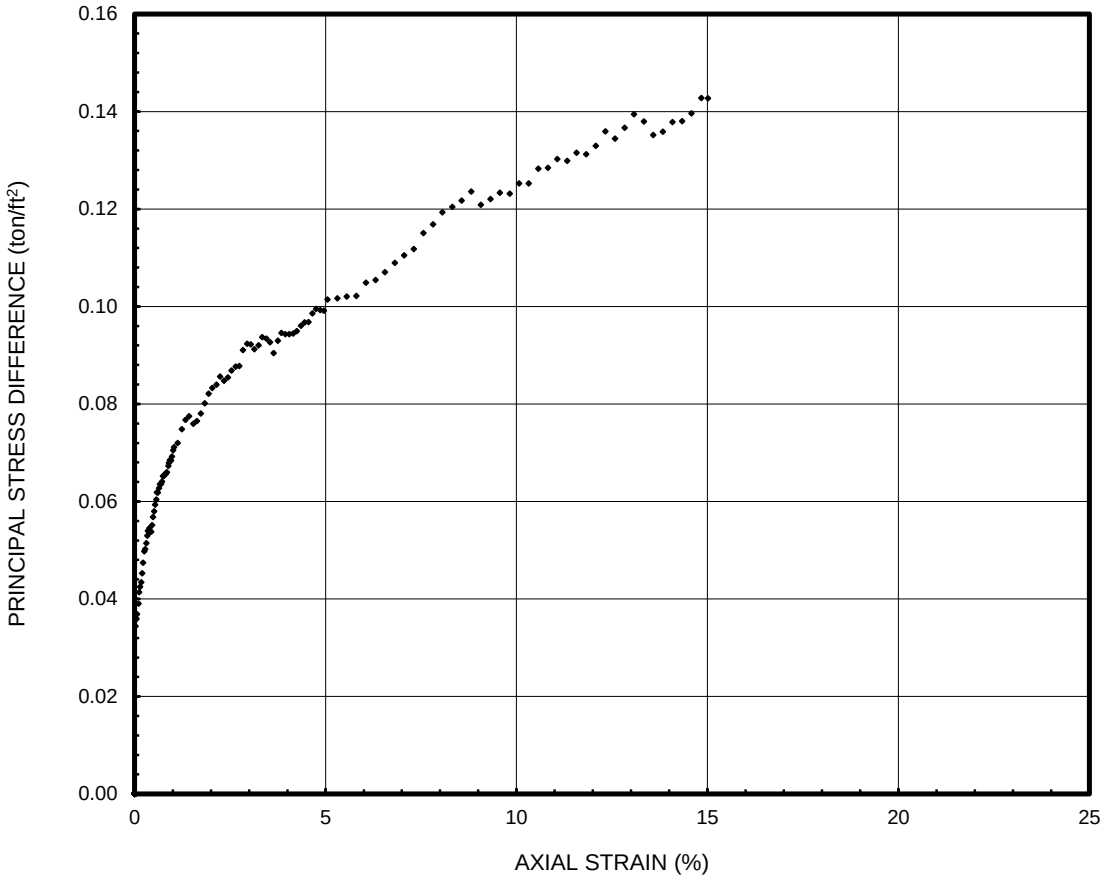
Appendix C. UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

This Appendix contains the following:

C.1 to C.9 Marsh Creation Area UU Test Results

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B10
Depth	0-2 ft
Description	Gray clay w/ silt pockets, trace organics



Initial Height	2.777	in	**Cell Pressure**	1.0	lb/in^2
Initial Diameter	1.397	in	**Strain Rate**	1.0	%/min
Dry Density	59.8	lb/ft^3	**Peak Stress**	0.15	ton/ft^2
Moisture Content	67.7	%	**Strain at Peak Stress**	14.84	%
Saturation	100.6	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

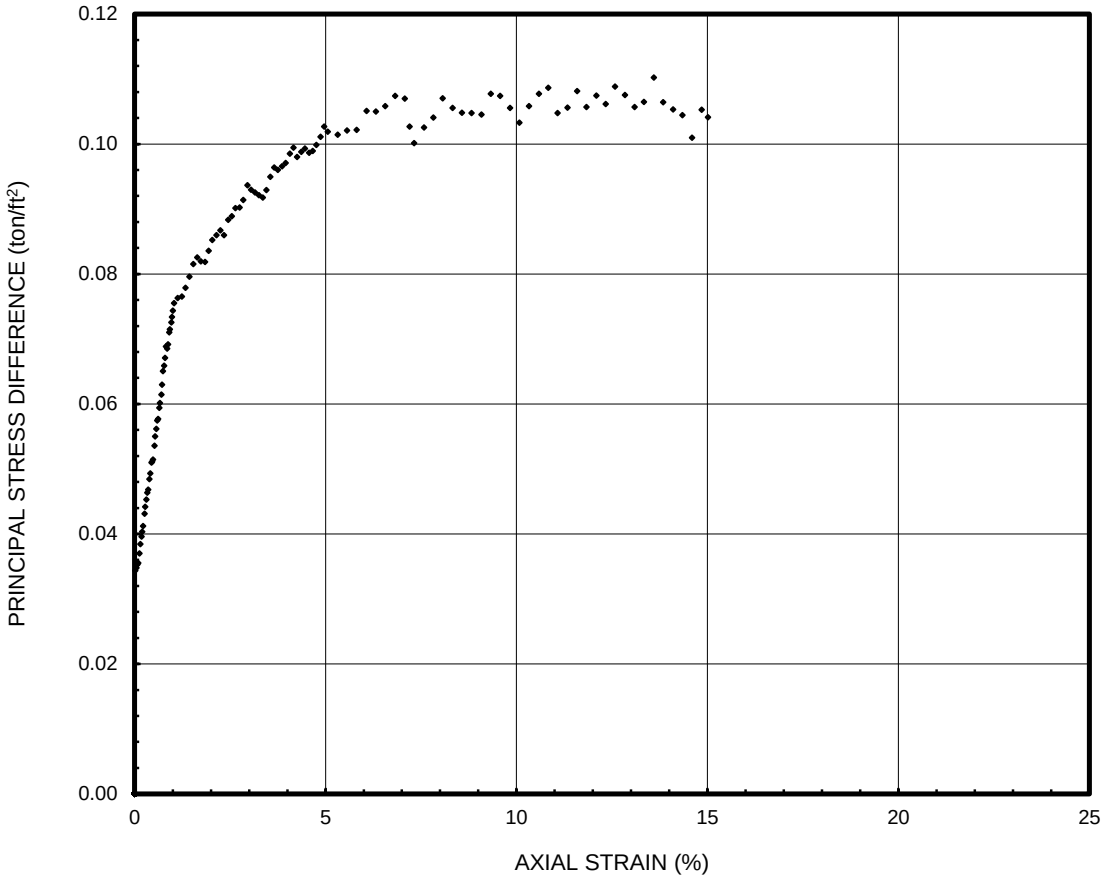
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-1

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B10
Depth	2-4 BL4 ft
Description	Gray clay w/ silt pockets, trace organics



Initial Height	2.788	in	**Cell Pressure**	2.0	lb/in^2
Initial Diameter	1.382	in	**Strain Rate**	1.0	%/min
Dry Density	54.8	lb/ft^3	**Peak Stress**	0.11	ton/ft^2
Moisture Content	74.2	%	**Strain at Peak Stress**	13.59	%
Saturation	96.4	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

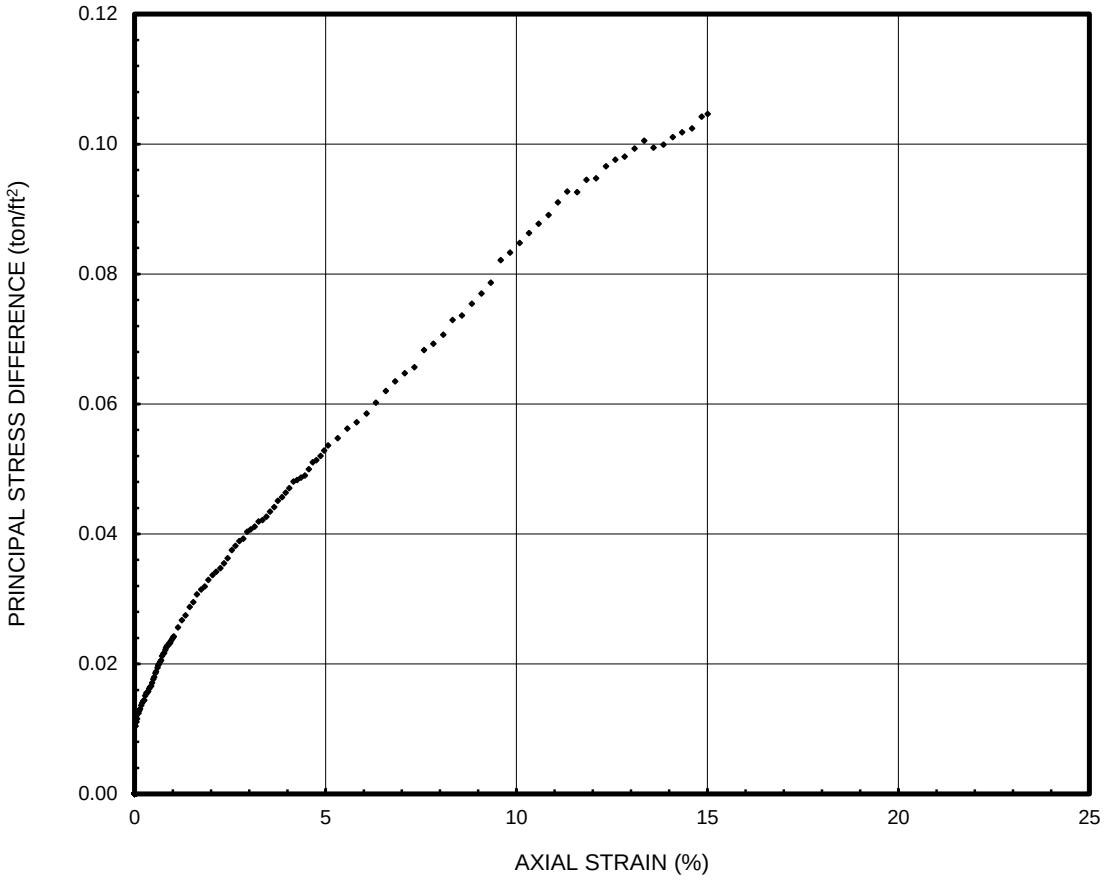
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-2

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B-11
Depth	0-2 ft
Description	Gray clay w/ organics



Initial Height	5.605	in	**Cell Pressure**	1.0	lb/in^2
Initial Diameter	2.730	in	**Strain Rate**	1.0	%/min
Dry Density	15.6	lb/ft^3	**Peak Stress**	0.11	ton/ft^2
Moisture Content	345.6	%	**Strain at Peak Stress**	15.01	%
Saturation	95.5	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

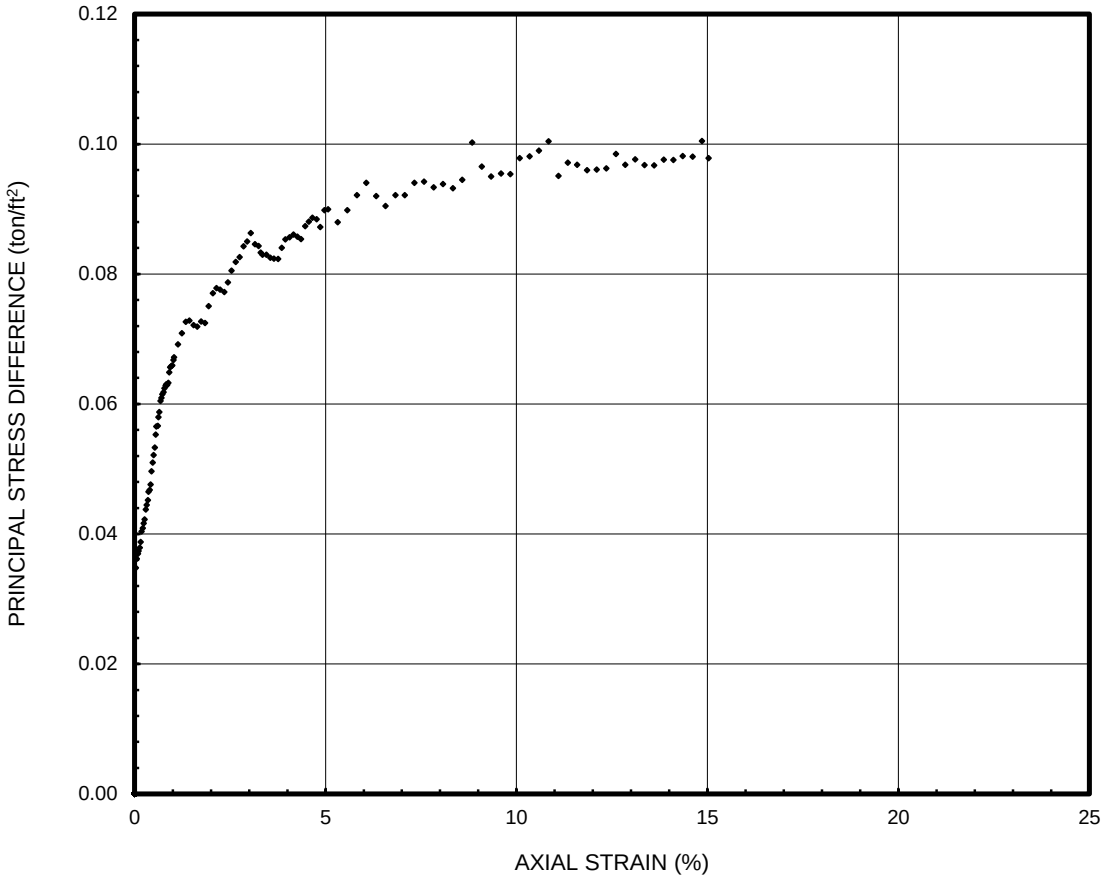
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-3

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B-11
Depth	2-4 BL. 2 ft
Description	Gray clay w/ silty sand pockets, trace organics



Initial Height	2.799	in	**Cell Pressure**	2.0	lb/in^2
Initial Diameter	1.370	in	**Strain Rate**	1.0	%/min
Dry Density	50.7	lb/ft^3	**Peak Stress**	0.10	ton/ft^2
Moisture Content	88.4	%	**Strain at Peak Stress**	14.86	%
Saturation	102.5	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

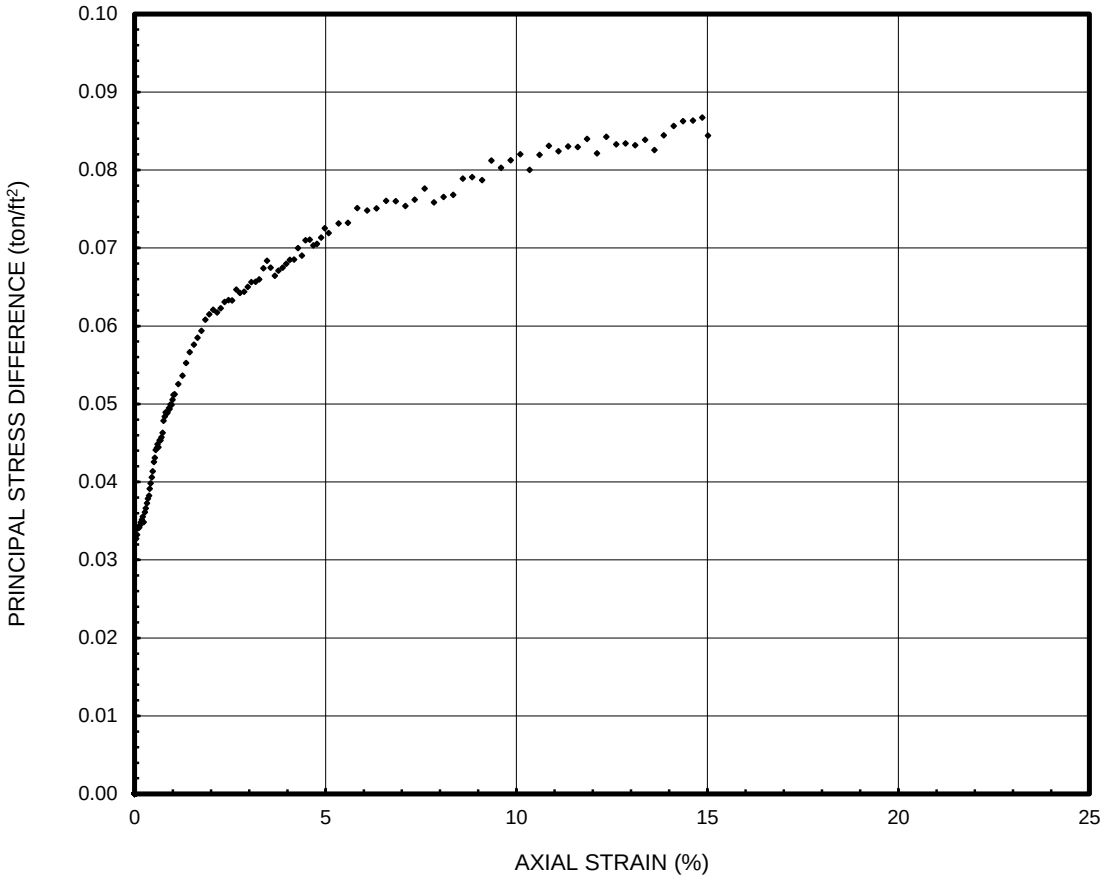
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-4

Unconsolidated Undrained Triaxial Compression Test

Project Name Caminada
Project Number 17-84-2810
Boring Number B-11
Depth 4-6 ft
Description Gray clay w/ organics



Initial Height	2.814	in	**Cell Pressure**	2.0	lb/in^2
Initial Diameter	1.375	in	**Strain Rate**	1.0	%/min
Dry Density	32.1	lb/ft^3	**Peak Stress**	0.09	ton/ft^2
Moisture Content	157.4	%	**Strain at Peak Stress**	14.87	%
Saturation	99.8	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

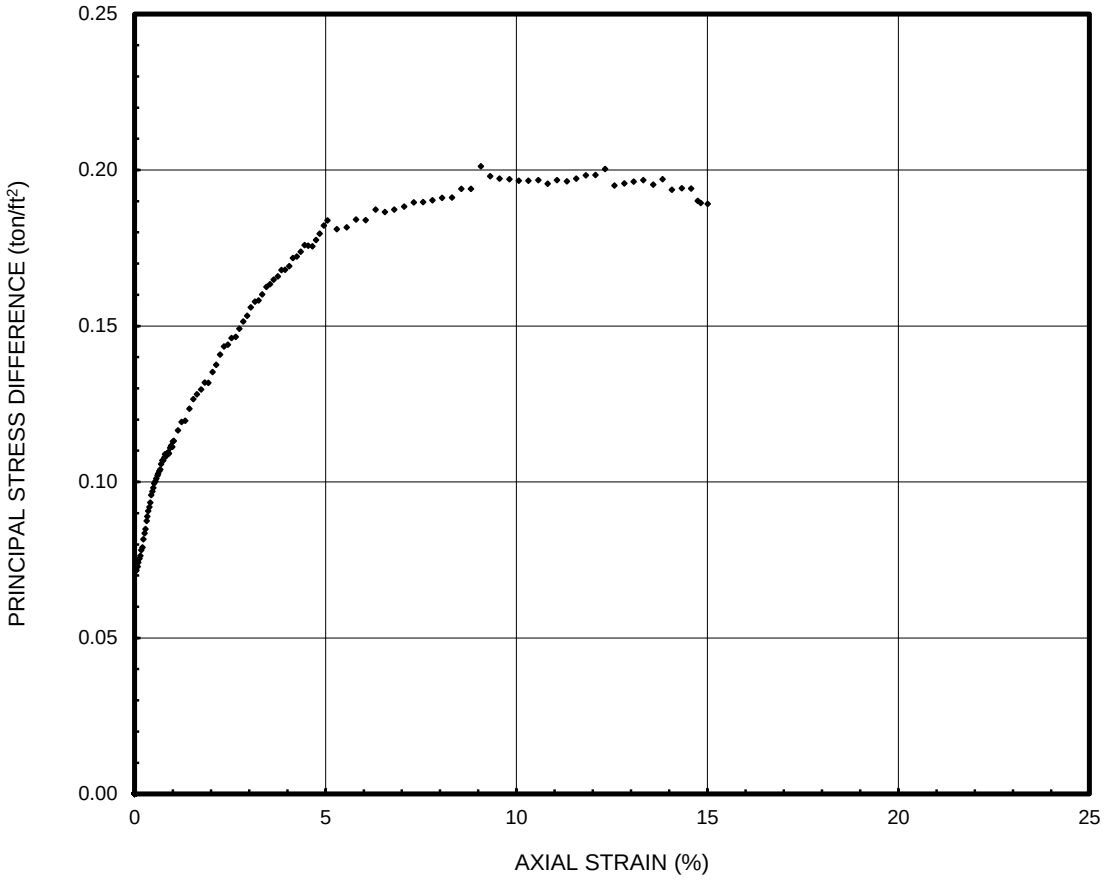
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-5

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B-11
Depth	12-14 ft
Description	Gray clay



Initial Height	2.793	in	**Cell Pressure**	6.0	lb/in^2
Initial Diameter	1.392	in	**Strain Rate**	1.0	%/min
Dry Density	51.4	lb/ft^3	**Peak Stress**	0.21	ton/ft^2
Moisture Content	84.7	%	**Strain at Peak Stress**	9.06	%
Saturation	100.3	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

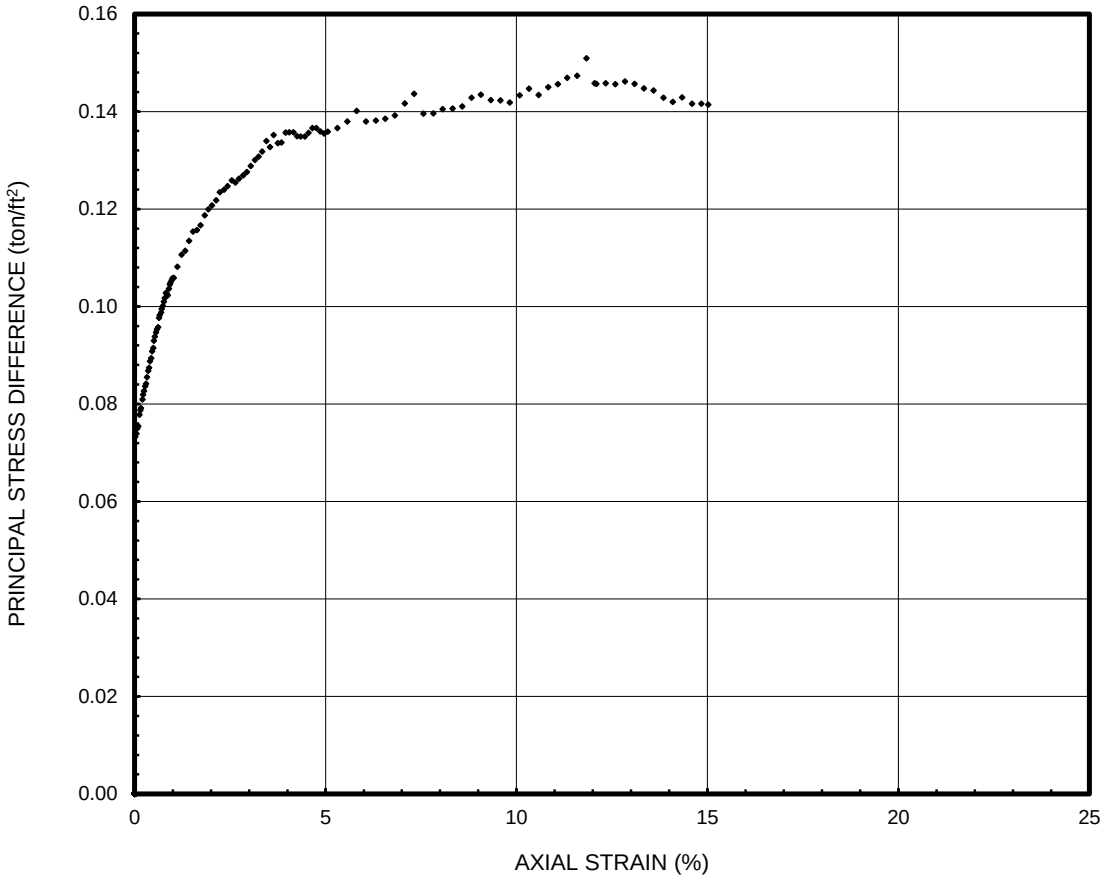
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-6

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B-11
Depth	12-14 BL3 ft
Description	Gray clay w/ silty sand pockets



Initial Height	2.792	in	**Cell Pressure**	6.0	lb/in^2
Initial Diameter	1.391	in	**Strain Rate**	1.0	%/min
Dry Density	52.8	lb/ft^3	**Peak Stress**	0.15	ton/ft^2
Moisture Content	78.4	%	**Strain at Peak Stress**	11.83	%
Saturation	96.5	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

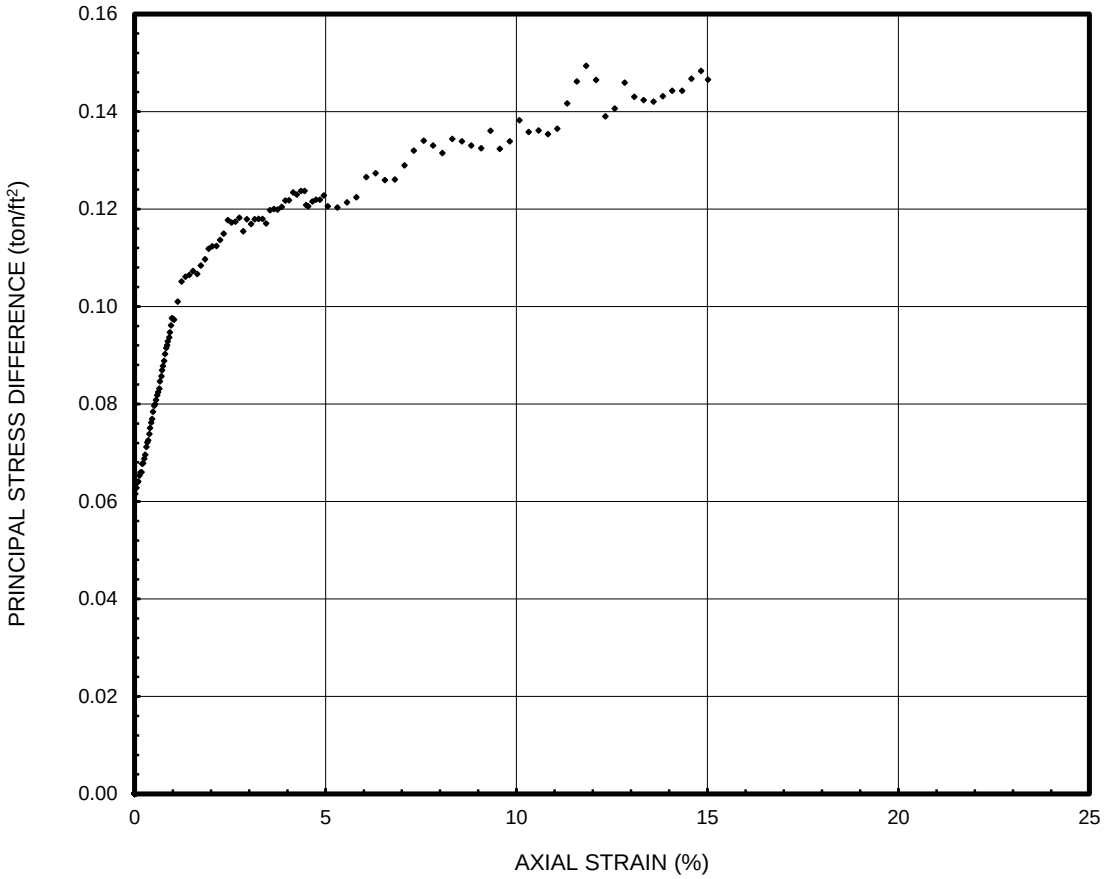
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-7

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B-11
Depth	14-16 BL2 ft
Description	Gray clay (top half) / silty sand (bottom half)



Initial Height	2.799	in	**Cell Pressure**	6.0	lb/in^2
Initial Diameter	1.377	in	**Strain Rate**	1.0	%/min
Dry Density	75.8	lb/ft^3	**Peak Stress**	0.15	ton/ft^2
Moisture Content	47.6	%	**Strain at Peak Stress**	11.82	%
Saturation	104.8	%	**Failure Type**	Bulging	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

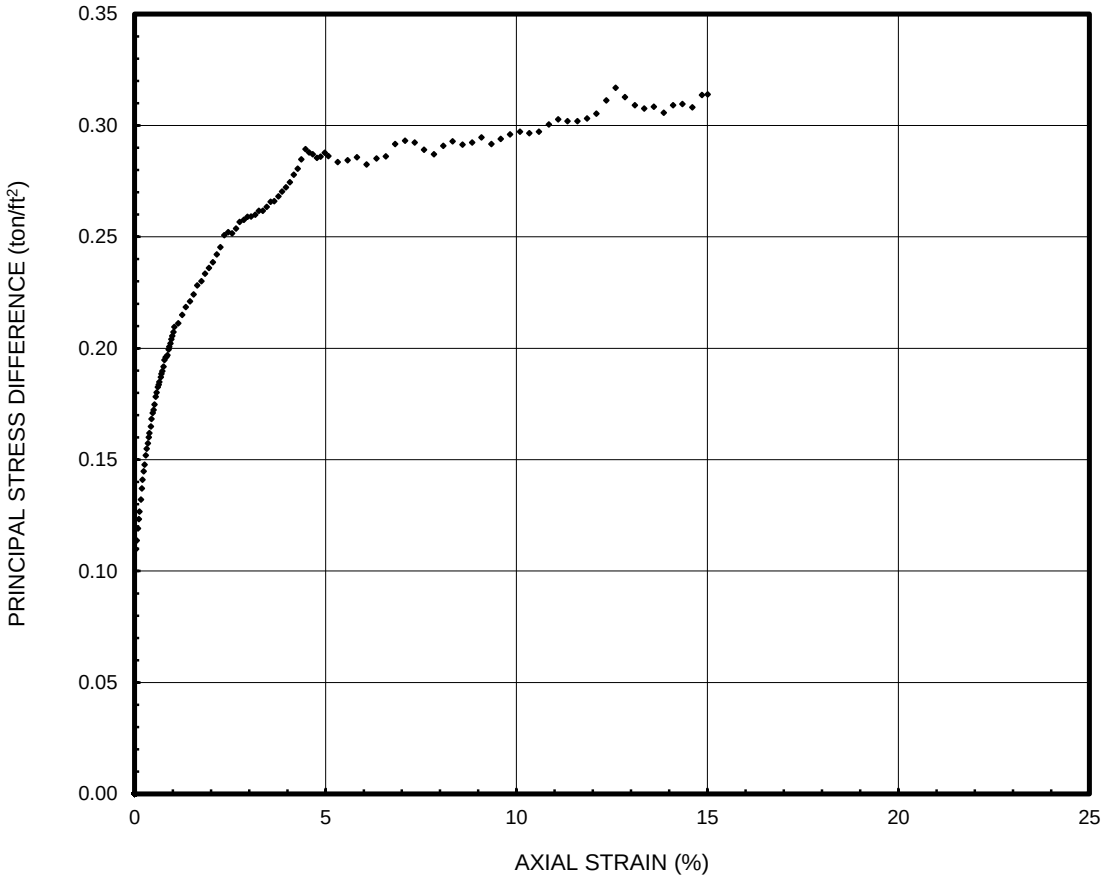
Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-8

Unconsolidated Undrained Triaxial Compression Test

Project Name	Caminada
Project Number	17-84-2810
Boring Number	B-11
Depth	33-35 ft
Description	Gray clay w/ silty sand pockets



Initial Height	2.791	in	**Cell Pressure**	14.0	lb/in^2
Initial Diameter	1.391	in	**Strain Rate**	1.0	%/min
Dry Density	62.8	lb/ft^3	**Peak Stress**	0.32	ton/ft^2
Moisture Content	60.2	%	**Strain at Peak Stress**	12.60	%
Saturation	96.4	%	**Failure Type**	Combination	

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

Caminada H.L. B.B. Marsh Creation Increment II (BA-193)

DRAWN BY: **CW**	CHECKED BY: **GFS**	DATE: **08/07/17**
FILE NO.:	APPROVED BY:	FIGURE:

Figure No. C-9

Appendix D. INCREMENTAL LOAD CONSOLIDATION TEST RESULTS

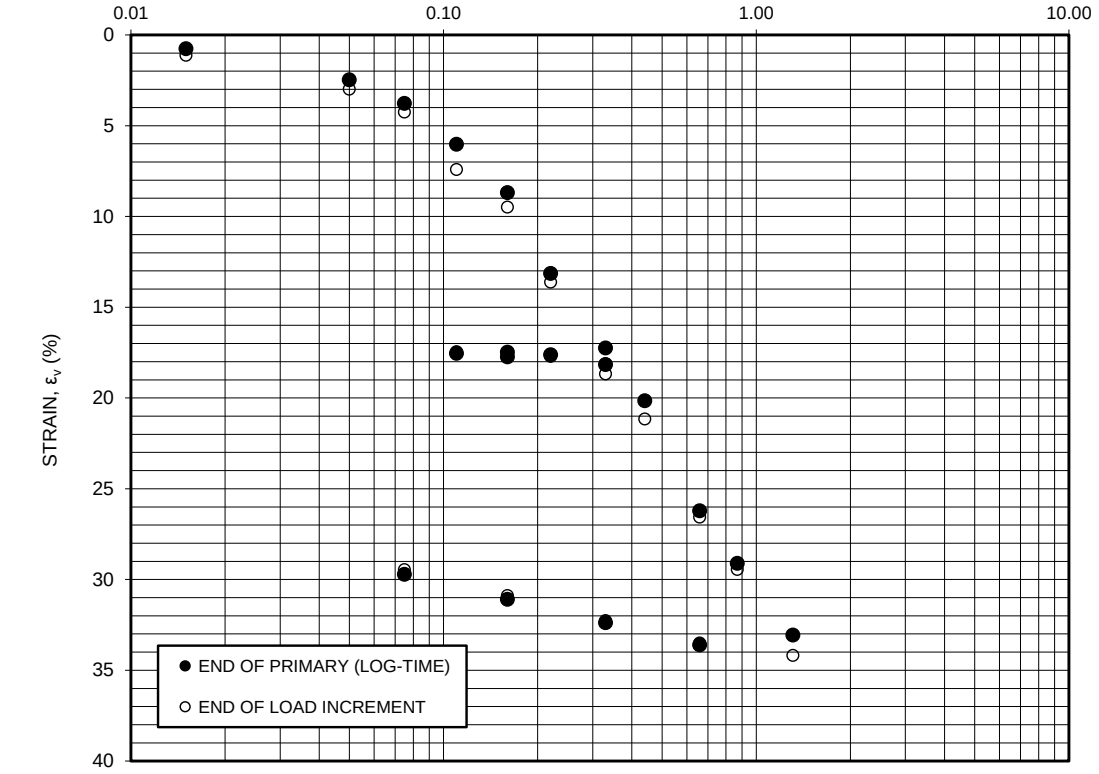
This Appendix contains the following:

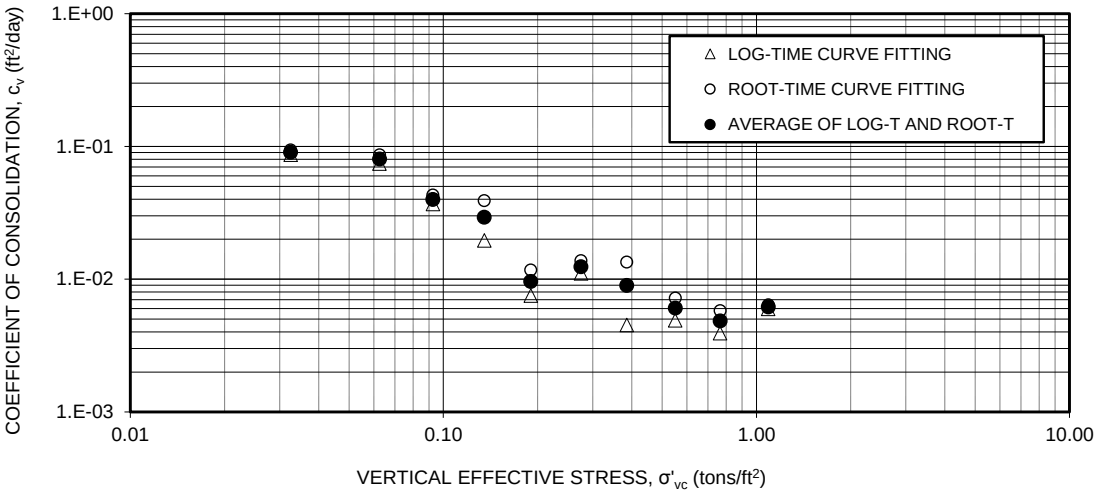
D.1 Consolidation Test Results: B-11 Sample 00-02

D.2 Consolidation Test Results: B-11 Sample 02-04

D.3 Consolidation Test Results: B-11 Sample 04-06

D.4 Consolidation Test Results: B-11 Sample 33-35





SAMPLE DATA	
BORING NO.:	B-11
SAMPLE DEPTH (ft):	0-2
DESCRIPTION:	Gray Clay CH

SPECIMEN CONDITIONS	INITIAL	FINAL
MOISTURE CONTENT (%):	116.3	70.2
DRY DENSITY (lb/ft³):	41.4	56.8
VOID RATIO:	3.000	1.912
WET DENSITY (lb/ft³):	89.4	96.7

INDEX PROPERTIES		
LIQUID LIMIT (%):	130	
PLASTIC LIMIT (%):	35	
PLASTICITY INDEX (%):	95	
SPECIFIC GRAVITY:	2.65	(Assumed)
-200 (%):	99.21	

CONSOLIDATION PARAMETERS	
VIRGIN COMPRESSION RATIO, CR:	0.26
RECOMPRESSION RATIO, RR:	0.013
PRECONSOLIDATION PRESSURE, σ'_p:	0.11
COMPRESSION INDEX, Cc:	1.04
RECOMPRESSION INDEX, Cr:	0.05

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BACK BARRIER (BA-193)
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY:	CHECKED BY:	DATE:
RJB		8-10-17
FILE NO.:	APPROVED BY:	FIGURE:
17-84-2810		

Figure No. D.1-1

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{50} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.2079	0.2079	0.2079		-	-	-	0.7500	0.7500	3.0000	3.0000	0.00	0.00	-----
0.02	0.2079	0.2136	0.2163				0.008	0.7443	0.7416	2.9696	2.9552	0.76	1.12	-----
0.05	0.2163	0.2264	0.2303	186	L	8.65E-02	0.033	0.7315	0.7276	2.9013	2.8805	2.47	2.99	0.00316
0.075	0.2303	0.2362	0.2397	210	L	7.41E-02	0.063	0.7217	0.7182	2.8490	2.8304	3.77	4.24	0.00181
0.11	0.2398	0.2532	0.2636	408	L	3.68E-02	0.093	0.7048	0.6944	2.7589	2.7034	6.03	7.41	0.00857
0.16	0.2637	0.2732	0.2792	720	L	1.96E-02	0.135	0.6849	0.6789	2.6528	2.6208	8.68	9.48	0.00838
0.22	0.2791	0.3065	0.3101	1740	L	7.54E-03	0.190	0.6515	0.6479	2.4746	2.4554	13.13	13.61	0.01200
0.33	0.3098	0.3370	0.3436	1080	L	1.10E-02	0.275	0.6207	0.6141	2.3104	2.2752	17.24	18.12	0.01200
0.16	0.3436	0.3407	0.3399	84	L	1.34E-01	0.245	0.6170	0.6178	2.2906	2.2949	17.73	17.63	-----
0.11	0.3398	0.3392	0.3385	120	L	9.44E-02	0.135	0.6184	0.6191	2.2982	2.3018	17.54	17.45	-----
0.16	0.3385	0.3387	0.3388				0.135	0.6189	0.6188	2.3008	2.3002	17.48	17.49	-----
0.22	0.3389	0.3399	0.3405	78	L	1.45E-01	0.190	0.6179	0.6172	2.2952	2.2917	17.62	17.71	-----
0.33	0.3404	0.3438	0.3476	162	L	6.93E-02	0.275	0.6138	0.6100	2.2736	2.2533	18.16	18.67	-----
0.44	0.3477	0.3588	0.3664	2400	L	4.51E-03	0.385	0.5989	0.5913	2.1941	2.1536	20.15	21.16	0.00857
0.66	0.3666	0.4045	0.4071	1980	L	4.91E-03	0.550	0.5534	0.5508	1.9515	1.9376	26.21	26.56	0.00973
0.87	0.4074	0.4265	0.4290	2220	L	3.91E-03	0.765	0.5317	0.5292	1.8357	1.8224	29.11	29.44	0.00933
1.31	0.4294	0.4565	0.4649	1320	L	5.97E-03	1.090	0.5021	0.4937	1.6779	1.6331	33.05	34.17	0.01360
0.66	0.4646	0.4603	0.4595	162	L	4.50E-02	0.985	0.4981	0.4988	1.6563	1.6603	33.59	33.49	-----
0.33	0.4595	0.4511	0.4503	630	L	1.19E-02	0.495	0.5072	0.5080	1.7051	1.7093	32.37	32.27	-----
0.16	0.4498	0.4410	0.4394	1260	L	6.18E-03	0.245	0.5168	0.5184	1.7563	1.7648	31.09	30.88	-----
0.075	0.4394	0.4306	0.4287	2400	L	3.38E-03	0.118	0.5272	0.5291	1.8117	1.8219	29.71	29.45	-----
														-----

				Initial Conditions	Final Conditions		
Project Name:	**Caminada Back Barrier**					EOP= End of Primary Consolidation	
File Number:	**17-84-2810**		Height (in)	0.7500	0.5460	EOI= End of load increment (typically 24 hrs +/-)	
Boring Number:	**B-11**		w_c (%)	116.3	70.2	Specific Gravity	2.65
Depth:	**0-2**		γt (pcf)	89.4	96.7	Ring Diameter (in)	2.0000
			γd (pcf)	41.4	56.8	Ring weight (g)	62.58
LL =	130	-200 = 99.21	Saturation (%)	102.7	97.3	Height of Solids (in)	0.1875
PI =	95	OC = --	Void ratio, e	3.0000	1.9120	Weight of Dry Soil (g)	25.58

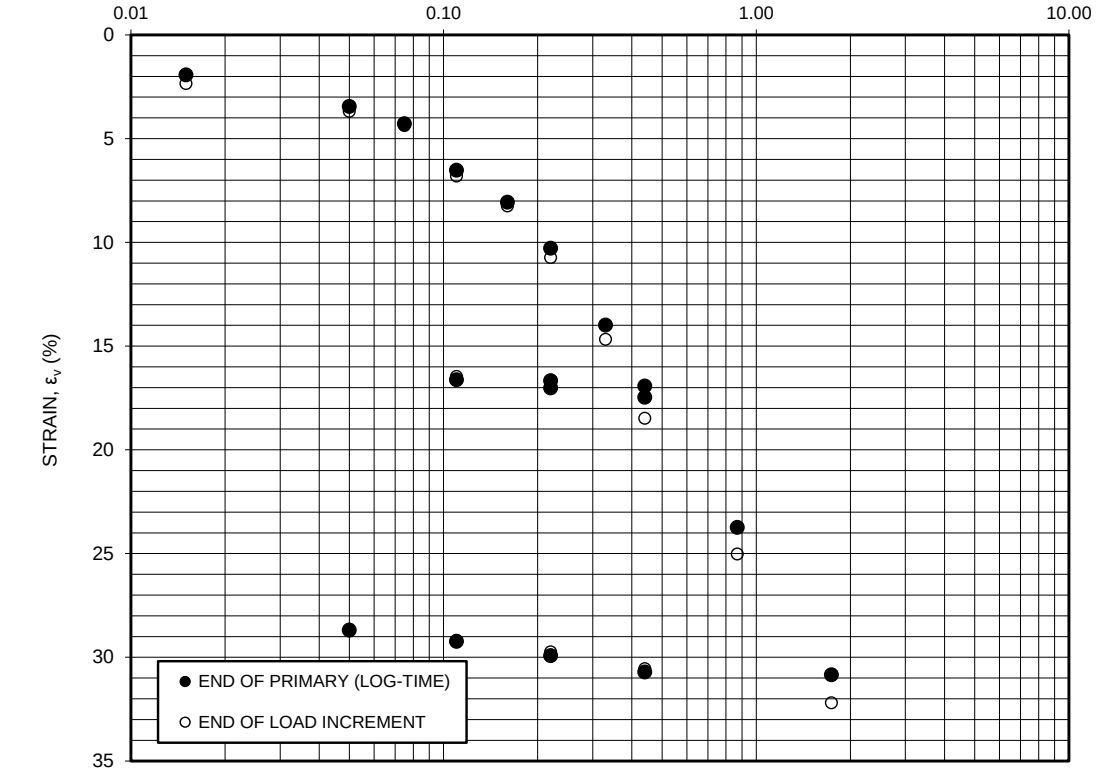
Figure No. D.1-2

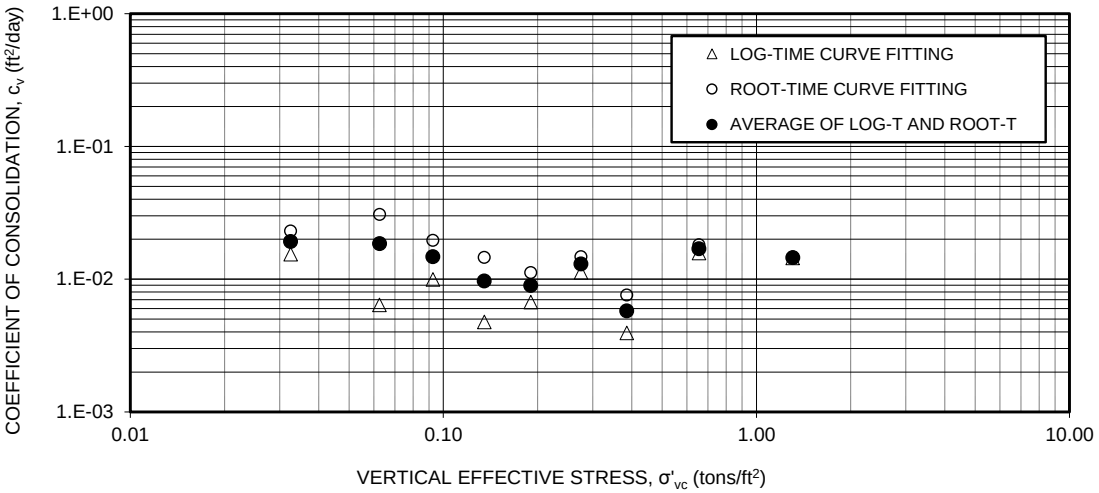
ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.2079	0.2079	0.2079		-	-	-	0.7500	0.7500	3.0000	3.0000	0.00	0.00	-----
0.015	0.2079	0.2136	0.2163				0.008	0.7443	0.7416	2.9696	2.9552	0.76	1.12	-----
0.05	0.2163	0.2259	0.2303	735	S	9.43E-02	0.033	0.7320	0.7276	2.9040	2.8805	2.40	2.99	0.00316
0.075	0.2303	0.2349	0.2397	778	S	8.63E-02	0.063	0.7230	0.7182	2.8560	2.8304	3.60	4.24	0.00181
0.11	0.2397	0.2528	0.2636	1500	S	4.31E-02	0.093	0.7051	0.6943	2.7605	2.7029	5.99	7.43	0.00857
0.16	0.2636	0.2705	0.2792	1561	S	3.90E-02	0.135	0.6874	0.6787	2.6661	2.6197	8.35	9.51	0.00838
0.22	0.2792	0.3011	0.3101	4860	S	1.17E-02	0.190	0.6568	0.6478	2.5029	2.4549	12.43	13.63	0.01200
0.33	0.3101	0.3345	0.3436	3745	S	1.38E-02	0.275	0.6234	0.6143	2.3248	2.2762	16.88	18.09	0.01200
0.16	0.3433	0.3407	0.3399	505	S	9.58E-02	0.245	0.6169	0.6177	2.2901	2.2944	17.75	17.64	-----
0.11	0.3398	0.3393	0.3385	290	S	1.68E-01	0.135	0.6182	0.6190	2.2972	2.3014	17.57	17.46	-----
0.16	0.3385	0.3387	0.3388				0.135	0.6188	0.6187	2.3004	2.2998	17.49	17.50	-----
0.22	0.3389	0.3399	0.3405	375	S	1.30E-01	0.190	0.6177	0.6171	2.2945	2.2913	17.64	17.72	-----
0.33	0.3405	0.3441	0.3476	653	S	7.40E-02	0.275	0.6135	0.6100	2.2721	2.2534	18.20	18.66	-----
0.44	0.3480	0.3588	0.3664	3466	S	1.35E-02	0.385	0.5992	0.5916	2.1958	2.1553	20.10	21.12	0.00857
0.66	0.3664	0.3968	0.4071	5881	S	7.21E-03	0.550	0.5612	0.5509	1.9932	1.9382	25.17	26.54	0.00973
0.87	0.4073	0.4234	0.4290	6490	S	5.80E-03	0.765	0.5348	0.5292	1.8524	1.8225	28.69	29.44	0.00933
1.31	0.4290	0.4553	0.4649	5302	S	6.41E-03	1.090	0.5029	0.4933	1.6822	1.6310	32.94	34.22	0.01360
0.66	0.4646	0.4611	0.4595	470	S	6.65E-02	0.985	0.4968	0.4984	1.6494	1.6580	33.76	33.55	-----
0.33	0.4593	0.4522	0.4503	2233	S	1.44E-02	0.495	0.5055	0.5074	1.6958	1.7060	32.60	32.35	-----
0.16	0.4500	0.4417	0.4394	4753	S	7.03E-03	0.245	0.5157	0.5180	1.7502	1.7625	31.24	30.94	-----
0.075	0.4394	0.4310	0.4287	9077	S	3.83E-03	0.118	0.5264	0.5287	1.8073	1.8196	29.82	29.51	-----

				Initial Conditions	Final Conditions	
Project Name:	**Caminada Back Barrier**					EOP= End of Primary Consolidation
File Number:	**17-84-2810**		Height (in)	0.7500	0.5460	EOI= End of load increment (typically 24 hrs +/-)
Boring Number:	**B-11**		w_c (%)	116.3	70.2	Specific Gravity 2.65
Depth:	**0-2**		γt (pcf)	89.4	96.7	Ring Diameter (in) 2.0000
			γd (pcf)	41.4	56.8	Ring weight (g) 62.58
LL = 130	-200 = 99.21		Saturation (%)	102.7	97.3	Height of Solids (in) 0.1875
PI = 95	OC = --		Void ratio, e	3.0000	1.9120	Weight of Dry Soil (g) 25.58

Figure No. D.1-3





SAMPLE DATA	
BORING NO.:	B-11
SAMPLE DEPTH (ft):	2-4
DESCRIPTION:	Gray Clay CH

SPECIMEN CONDITIONS	INITIAL	FINAL
MOISTURE CONTENT (%):	98.0	58.6
DRY DENSITY (lb/ft³):	47.2	66.2
VOID RATIO:	2.502	1.499
WET DENSITY (lb/ft³):	93.5	105.0

INDEX PROPERTIES		
LIQUID LIMIT (%):	71	
PLASTIC LIMIT (%):	22	
PLASTICITY INDEX (%):	49	
SPECIFIC GRAVITY:	2.65	(Assumed)
-200 (%):	100	

CONSOLIDATION PARAMETERS	
VIRGIN COMPRESSION RATIO, CR:	0.236
RECOMPRESSION RATIO, RR:	0.014
PRECONSOLIDATION PRESSURE, σ'_p:	0.16
COMPRESSION INDEX, Cc:	0.83
RECOMPRESSION INDEX, Cr:	0.05

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BACK BARRIER (BA-193)
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY:	CHECKED BY:	DATE:
RJB		8-10-17
FILE NO.:	APPROVED BY:	FIGURE:
17-84-2810		

Figure No. D.2-1

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{50} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.1656	0.1656	0.1656		-	-	-	0.7500	0.7500	2.5017	2.5017	0.00	0.00	-----
0.02	0.1656	0.1800	0.1832				0.008	0.7356	0.7324	2.4345	2.4195	1.92	2.35	-----
0.05	0.1832	0.1914	0.1932	1020	L	1.54E-02	0.033	0.7242	0.7224	2.3812	2.3728	3.44	3.68	0.00347
0.075	0.1932	0.1977	0.1984	2400	L	6.41E-03	0.063	0.7179	0.7172	2.3518	2.3486	4.28	4.37	0.00320
0.11	0.1984	0.2145	0.2166	1500	L	9.94E-03	0.093	0.7011	0.6990	2.2734	2.2636	6.52	6.80	0.00667
0.16	0.2167	0.2262	0.2275	3000	L	4.76E-03	0.135	0.6895	0.6882	2.2192	2.2132	8.07	8.24	0.00667
0.22	0.2277	0.2430	0.2464	2040	L	6.73E-03	0.190	0.6729	0.6695	2.1417	2.1258	10.28	10.73	0.00933
0.33	0.2464	0.2708	0.2759	1140	L	1.12E-02	0.275	0.6451	0.6400	2.0119	1.9881	13.99	14.67	0.00933
0.44	0.2759	0.2928	0.2967	3000	L	3.94E-03	0.385	0.6231	0.6192	1.9092	1.8910	16.92	17.44	0.01000
0.22	0.2970	0.2938	0.2929	66	L	1.73E-01	0.330	0.6224	0.6233	1.9059	1.9101	17.01	16.89	-----
0.11	0.2929	0.2909	0.2897	120	L	9.63E-02	0.165	0.6253	0.6265	1.9196	1.9251	16.62	16.47	-----
0.22	0.2898	0.2913	0.2919	78	L	1.49E-01	0.165	0.6250	0.6244	1.9181	1.9153	16.67	16.75	-----
0.44	0.2922	0.2976	0.3052	123	L	9.32E-02	0.330	0.6190	0.6114	1.8901	1.8546	17.47	18.48	-----
0.87	0.3056	0.3450	0.3546	660	L	1.57E-02	0.655	0.5720	0.5624	1.6706	1.6258	23.73	25.01	0.01333
1.74	0.3553	0.3990	0.4091	600	L	1.44E-02	1.305	0.5187	0.5086	1.4218	1.3746	30.84	32.19	0.01013
0.44	0.4084	0.3973	0.3961	252	L	3.11E-02	1.090	0.5197	0.5209	1.4264	1.4320	30.71	30.55	-----
0.22	0.3959	0.3912	0.3898	600	L	1.35E-02	0.330	0.5256	0.5270	1.4540	1.4605	29.92	29.73	-----
0.11	0.3896	0.3858	0.3855	2400	L	3.46E-03	0.165	0.5308	0.5311	1.4781	1.4797	29.23	29.19	-----
0.05	0.3855	0.3818	0.3814	4800	L	1.75E-03	0.080	0.5348	0.5352	1.4969	1.4988	28.69	28.64	-----

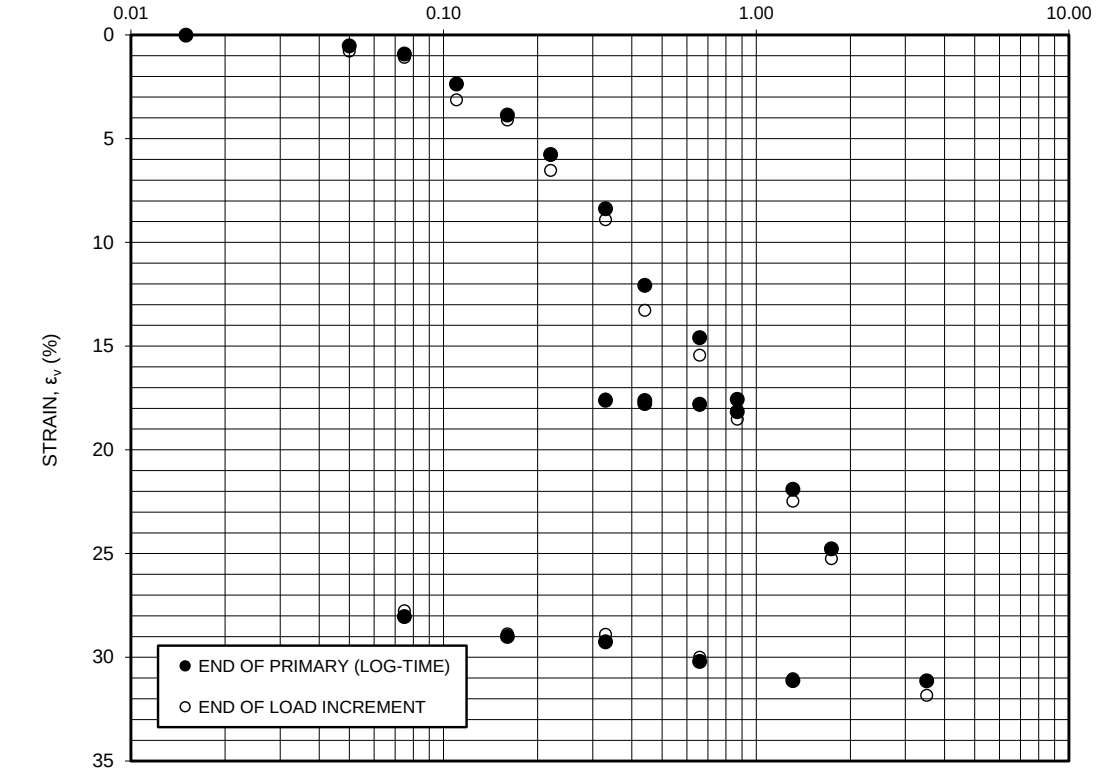
				Initial Conditions	Final Conditions		
Project Name:	**Caminada Back Barrier**					EOP= End of Primary Consolidation	
File Number:	**17-84-2810**		Height (in)	0.7500	0.5353	EOI= End of load increment (typically 24 hrs +/-)	
Boring Number:	**B-11**		w_c (%)	98.0	58.6	Specific Gravity	2.65
Depth:	**2-4**		γt (pcf)	93.5	105.0	Ring Diameter (in)	2.0000
			γd (pcf)	47.2	66.2	Ring weight (g)	62.50
LL =	71	-200 = 100	Saturation (%)	103.8	103.6	Height of Solids (in)	0.2142
PI =	49	OC = --	Void ratio, e	2.5017	1.4993	Weight of Dry Soil (g)	29.22

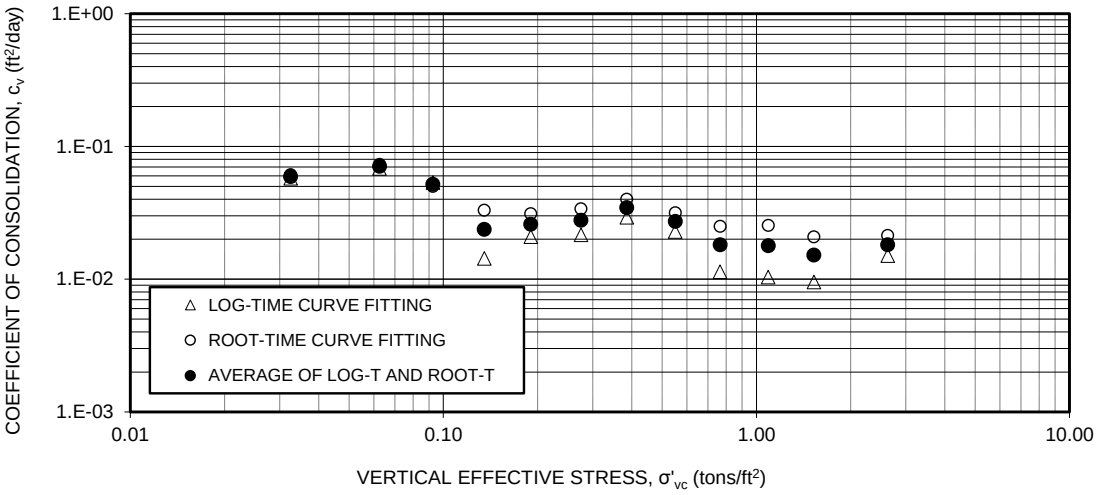
ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.1656	0.1656	0.1656		-	-	-	0.7500	0.7500	2.5017	2.5017	0.00	0.00	-----
0.015	0.1656	0.1800	0.1832				0.008	0.7356	0.7324	2.4345	2.4195	1.92	2.35	-----
0.05	0.1832	0.1903	0.1932	2940	S	2.31E-02	0.033	0.7253	0.7224	2.3864	2.3728	3.29	3.68	0.00347
0.075	0.1932	0.1956	0.1984	2160	S	3.07E-02	0.063	0.7200	0.7172	2.3616	2.3486	4.00	4.37	0.00320
0.11	0.1984	0.2107	0.2166	3286	S	1.96E-02	0.093	0.7049	0.6990	2.2911	2.2636	6.01	6.80	0.00667
0.16	0.2166	0.2228	0.2275	4234	S	1.46E-02	0.135	0.6928	0.6881	2.2346	2.2127	7.63	8.25	0.00667
0.22	0.2275	0.2399	0.2464	5302	S	1.12E-02	0.190	0.6757	0.6692	2.1548	2.1244	9.91	10.77	0.00933
0.33	0.2464	0.2678	0.2759	3745	S	1.48E-02	0.275	0.6478	0.6397	2.0245	1.9867	13.63	14.71	0.00933
0.44	0.2759	0.2890	0.2967	6742	S	7.59E-03	0.385	0.6266	0.6189	1.9255	1.8896	16.45	17.48	0.01000
0.22	0.2965	0.2943	0.2929	240	S	2.04E-01	0.330	0.6211	0.6225	1.8999	1.9064	17.19	17.00	-----
0.11	0.2926	0.2910	0.2897	653	S	7.59E-02	0.165	0.6241	0.6254	1.9138	1.9199	16.79	16.62	-----
0.22	0.2898	0.2911	0.2919	375	S	1.33E-01	0.165	0.6241	0.6233	1.9138	1.9101	16.79	16.89	-----
0.44	0.2920	0.2978	0.3052	614	S	8.00E-02	0.330	0.6175	0.6101	1.8830	1.8485	17.67	18.65	-----
0.87	0.3052	0.3416	0.3546	2458	S	1.82E-02	0.655	0.5737	0.5607	1.6785	1.6178	23.51	25.24	0.01333
1.74	0.3550	0.3967	0.4091	2535	S	1.47E-02	1.305	0.5190	0.5066	1.4231	1.3652	30.80	32.45	0.01013
0.44	0.4084	0.3997	0.3961	653	S	5.10E-02	1.090	0.5153	0.5189	1.4058	1.4227	31.29	30.81	-----
0.22	0.3960	0.3922	0.3898	1622	S	2.13E-02	0.330	0.5227	0.5251	1.4404	1.4516	30.31	29.99	-----
0.11	0.3898	0.3875	0.3855	2160	S	1.64E-02	0.165	0.5273	0.5293	1.4621	1.4714	29.69	29.42	-----
0.05	0.3855	0.3822	0.3814	20535	S	1.75E-03	0.080	0.5326	0.5334	1.4869	1.4906	28.98	28.87	-----

					Initial Conditions	Final Conditions		
Project Name:	**Caminada Back Barrier**						EOP= End of Primary Consolidation	
File Number:	**17-84-2810**			Height (in)	0.7500	0.5353	EOI= End of load increment (typically 24 hrs +/-)	
Boring Number:	**B-11**			w_c (%)	98.0	58.6	Specific Gravity	2.65
Depth:	**2-4**			γt (pcf)	93.5	105.0	Ring Diameter (in)	2.0000
				γd (pcf)	47.2	66.2	Ring weight (g)	62.50
LL =	71	-200 =	100	Saturation (%)	103.8	103.6	Height of Solids (in)	0.2142
PI =	49	OC =	--	Void ratio, e	2.5017	1.4993	Weight of Dry Soil (g)	29.22

Figure No. D.2-3





SAMPLE DATA	
BORING NO.:	B-11
SAMPLE DEPTH (ft):	4-6
DESCRIPTION:	Gray Clay CH

SPECIMEN CONDITIONS	INITIAL	FINAL
MOISTURE CONTENT (%):	80.9	47.8
DRY DENSITY (lb/ft³):	53.1	73.5
VOID RATIO:	2.113	1.250
WET DENSITY (lb/ft³):	96.1	108.7

INDEX PROPERTIES		
LIQUID LIMIT (%):	136	
PLASTIC LIMIT (%):	35	
PLASTICITY INDEX (%):	101	
SPECIFIC GRAVITY:	2.65	(Assumed)
-200 (%):	98.93	

CONSOLIDATION PARAMETERS	
VIRGIN COMPRESSION RATIO, CR:	0.22
RECOMPRESSION RATIO, RR:	0.011
PRECONSOLIDATION PRESSURE, σ'_p:	0.24
COMPRESSION INDEX, Cc:	0.68
RECOMPRESSION INDEX, Cr:	0.03

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BACK BARRIER (BA-193)
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY:	CHECKED BY:	DATE:
RJB		8-10-17
FILE NO.:	APPROVED BY:	FIGURE:
17-84-2810		

Figure No. D.3-1

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{50} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.1632	0.1632	0.1632	-	-	-	-	0.7490	0.7490	2.1134	2.1134	0.00	0.00	-----
0.02	0.1632	0.1633	0.1634				0.008	0.7489	0.7488	2.1130	2.1126	0.01	0.03	-----
0.05	0.1634	0.1672	0.1690	288	L	5.74E-02	0.033	0.7450	0.7432	2.0968	2.0893	0.53	0.77	0.00173
0.075	0.1690	0.1701	0.1713	240	L	6.81E-02	0.063	0.7421	0.7409	2.0848	2.0798	0.92	1.08	0.00048
0.11	0.1716	0.1812	0.1869	300	L	5.36E-02	0.093	0.7313	0.7256	2.0399	2.0162	2.36	3.12	0.00480
0.16	0.1870	0.1925	0.1943	1080	L	1.43E-02	0.135	0.7201	0.7183	1.9933	1.9858	3.86	4.10	0.00267
0.22	0.1942	0.2067	0.2124	720	L	2.09E-02	0.190	0.7058	0.7001	1.9339	1.9102	5.77	6.53	0.00907
0.33	0.2123	0.2261	0.2301	660	L	2.16E-02	0.275	0.6863	0.6823	1.8528	1.8362	8.37	8.91	0.00586
0.44	0.2298	0.2535	0.2625	456	L	2.92E-02	0.385	0.6586	0.6496	1.7377	1.7003	12.07	13.27	0.01227
0.66	0.2631	0.2730	0.2793	540	L	2.28E-02	0.550	0.6397	0.6334	1.6591	1.6329	14.59	15.43	0.00760
0.87	0.2793	0.2953	0.2995	1020	L	1.14E-02	0.765	0.6174	0.6132	1.5664	1.5489	17.57	18.13	0.00853
0.44	0.2995	0.2968	0.2966	60	L	1.87E-01	0.655	0.6159	0.6161	1.5602	1.5610	17.77	17.74	-----
0.33	0.2963	0.2953	0.2949	78	L	1.45E-01	0.385	0.6171	0.6175	1.5652	1.5668	17.61	17.56	-----
0.44	0.2949	0.2954	0.2955				0.385	0.6170	0.6169	1.5647	1.5643	17.62	17.64	-----
0.66	0.2957	0.2969	0.2973	60	L	1.88E-01	0.550	0.6157	0.6153	1.5593	1.5577	17.80	17.85	-----
0.87	0.2974	0.2997	0.3024	78	L	1.43E-01	0.765	0.6130	0.6103	1.5481	1.5369	18.16	18.52	-----
1.31	0.3026	0.3279	0.3322	1020	L	1.04E-02	1.090	0.5850	0.5807	1.4317	1.4138	21.90	22.47	0.01067
1.74	0.3320	0.3492	0.3528	1020	L	9.51E-03	1.525	0.5635	0.5599	1.3424	1.3274	24.77	25.25	0.00800
3.51	0.3539	0.3980	0.4032	570	L	1.50E-02	2.625	0.5158	0.5106	1.1441	1.1225	31.13	31.83	0.00747
1.31	0.4022	0.3969	0.3962	138	L	5.66E-02	2.410	0.5159	0.5166	1.1445	1.1474	31.12	31.03	-----
0.66	0.3957	0.3895	0.3880	420	L	1.91E-02	0.985	0.5229	0.5243	1.1734	1.1794	30.19	30.00	-----
0.33	0.3878	0.3822	0.3795	600	L	1.37E-02	0.495	0.5299	0.5326	1.2027	1.2139	29.25	28.89	-----
0.16	0.3794	0.3719	0.3709	1920	L	4.31E-03	0.410	0.5318	0.5328	1.2106	1.2147	29.00	28.87	-----
0.075	0.3707	0.3643	0.3622	2400	L	3.55E-03	0.203	0.5390	0.5411	1.2405	1.2492	28.04	27.76	-----

				Initial Conditions	Final Conditions		
Project Name:	**Caminada Back Barrier**					EOP= End of Primary Consolidation	
File Number:	**17-84-2810**		Height (in)	0.7490	0.5414	EOI= End of load increment (typically 24 hrs +/-)	
Boring Number:	**B-11**		w_c (%)	80.9	47.8	Specific Gravity	2.65
Depth:	**4-6**		γt (pcf)	96.1	108.7	Ring Diameter (in)	2.0000
			γd (pcf)	53.1	73.5	Ring weight (g)	62.54
LL =	136	-200 = 98.93	Saturation (%)	101.4	101.3	Height of Solids (in)	0.2406
PI =	101	OC = --	Void ratio, e	2.1134	1.2505	Weight of Dry Soil (g)	32.82

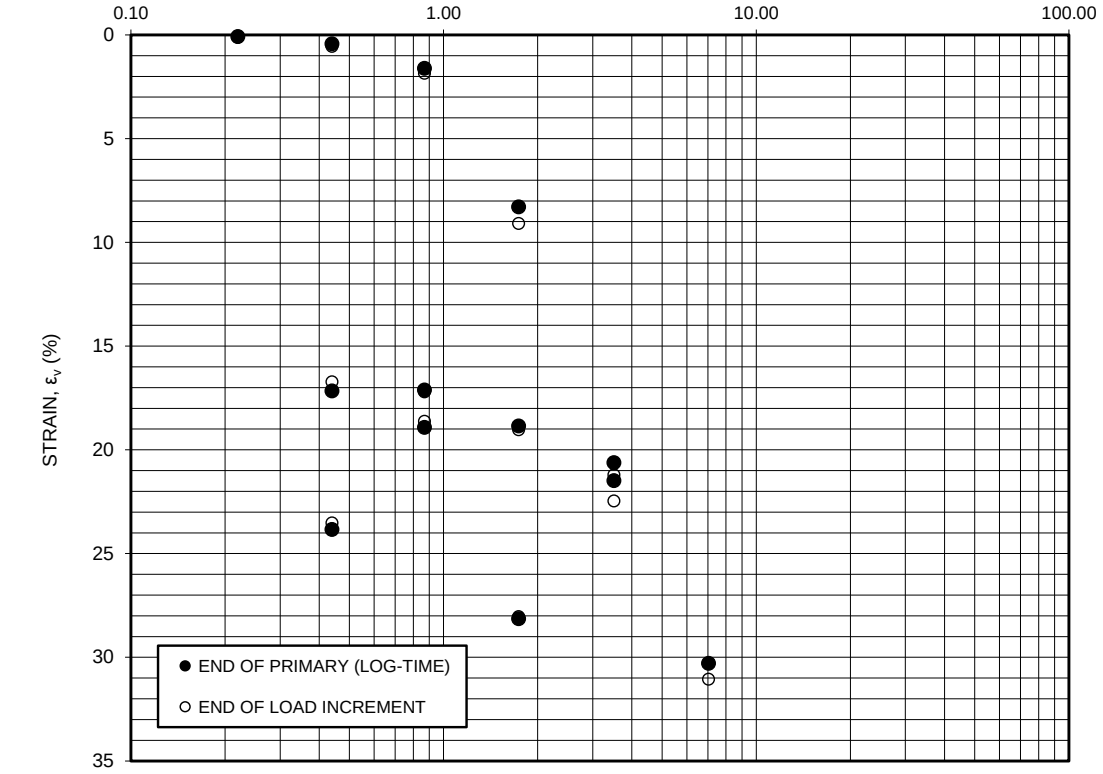
Figure No. D.3-2

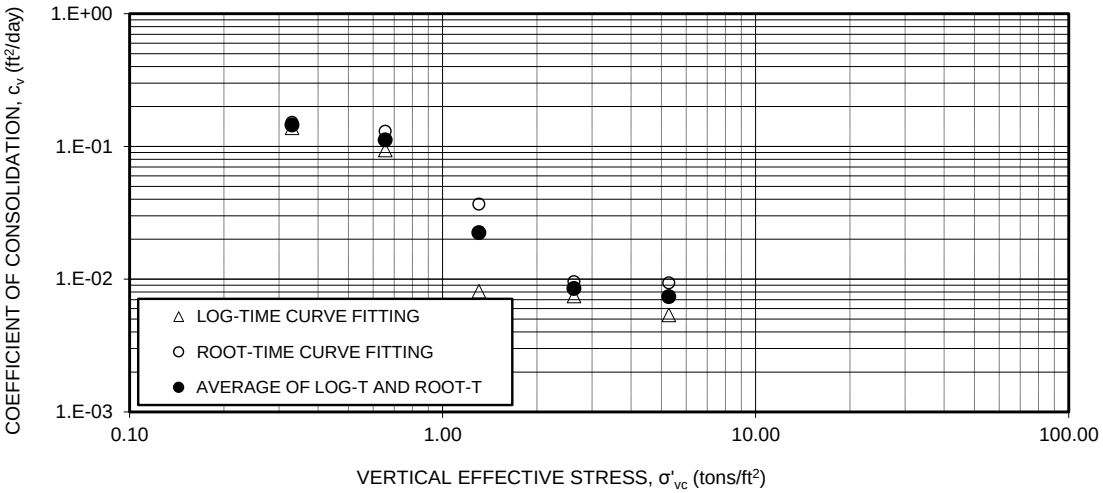
ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.1632	0.1632	0.1632		-	-	-	0.7490	0.7490	2.1134	2.1134	0.00	0.00	-----
0.015	0.1632	0.1633	0.1634				0.008	0.7489	0.7488	2.1130	2.1126	0.01	0.03	-----
0.05	0.1634	0.1673	0.1690	1162	S	6.13E-02	0.033	0.7449	0.7432	2.0964	2.0893	0.55	0.77	0.00173
0.075	0.1690	0.1701	0.1713	960	S	7.33E-02	0.063	0.7421	0.7409	2.0848	2.0798	0.92	1.08	0.00048
0.11	0.1716	0.1817	0.1869	1382	S	5.00E-02	0.093	0.7308	0.7256	2.0378	2.0162	2.43	3.12	0.00480
0.16	0.1870	0.1910	0.1943	2018	S	3.31E-02	0.135	0.7216	0.7183	1.9995	1.9858	3.66	4.10	0.00267
0.22	0.1943	0.2043	0.2124	2089	S	3.11E-02	0.190	0.7083	0.7002	1.9443	1.9106	5.43	6.52	0.00907
0.33	0.2124	0.2231	0.2301	1815	S	3.40E-02	0.275	0.6895	0.6825	1.8661	1.8370	7.94	8.88	0.00586
0.44	0.2301	0.2504	0.2625	1441	S	4.00E-02	0.385	0.6622	0.6501	1.7526	1.7023	11.59	13.20	0.01227
0.66	0.2631	0.2715	0.2793	1685	S	3.16E-02	0.550	0.6417	0.6339	1.6674	1.6350	14.33	15.37	0.00760
0.87	0.2796	0.2906	0.2995	2018	S	2.50E-02	0.765	0.6229	0.6140	1.5893	1.5523	16.84	18.02	0.00853
0.44	0.2980	0.2971	0.2966	154	S	3.13E-01	0.655	0.6149	0.6154	1.5561	1.5582	17.90	17.83	-----
0.33	0.2964	0.2956	0.2949	173	S	2.80E-01	0.385	0.6163	0.6170	1.5617	1.5646	17.72	17.63	-----
0.44	0.2951	0.2953	0.2955	22	S	2.21E+00	0.385	0.6167	0.6165	1.5636	1.5627	17.66	17.69	-----
0.66	0.2957	0.2966	0.2973	173	S	2.80E-01	0.550	0.6156	0.6149	1.5591	1.5562	17.81	17.90	-----
0.87	0.2974	0.2995	0.3024	317	S	1.52E-01	0.765	0.6128	0.6099	1.5474	1.5354	18.18	18.57	-----
1.31	0.3024	0.3197	0.3322	1815	S	2.54E-02	1.090	0.5926	0.5801	1.4635	1.4115	20.88	22.54	0.01067
1.74	0.3323	0.3443	0.3528	2018	S	2.08E-02	1.525	0.5681	0.5596	1.3616	1.3263	24.15	25.28	0.00800
3.51	0.3535	0.3913	0.4032	1750	S	2.13E-02	2.625	0.5218	0.5099	1.1692	1.1197	30.33	31.92	0.00747
1.31	0.4023	0.3979	0.3962	406	S	8.25E-02	2.410	0.5143	0.5160	1.1380	1.1451	31.33	31.10	-----
0.66	0.3958	0.3907	0.3880	1109	S	3.09E-02	0.985	0.5211	0.5238	1.1663	1.1775	30.42	30.06	-----
0.33	0.3877	0.3820	0.3795	2857	S	1.24E-02	0.495	0.5295	0.5320	1.2012	1.2116	29.30	28.97	-----
0.16	0.3794	0.3732	0.3709	6242	S	5.86E-03	0.245	0.5382	0.5405	1.2374	1.2469	28.14	27.83	-----
0.075	0.3709	0.3635	0.3622	12269	S	2.99E-03	0.203	0.5394	0.5407	1.2421	1.2475	27.99	27.81	-----

				Initial Conditions	Final Conditions	
Project Name:	**Caminada Back Barrier**					EOP= End of Primary Consolidation
File Number:	**17-84-2810**		Height (in)	0.7490	0.5414	EOI= End of load increment (typically 24 hrs +/-)
Boring Number:	**B-11**		w_c (%)	80.9	47.8	Specific Gravity 2.65
Depth:	**4-6**		γt (pcf)	96.1	108.7	Ring Diameter (in) 2.0000
			γd (pcf)	53.1	73.5	Ring weight (g) 62.54
LL = 136	-200 = 98.93		Saturation (%)	101.4	101.3	Height of Solids (in) 0.2406
PI = 101	OC = --		Void ratio, e	2.1134	1.2505	Weight of Dry Soil (g) 32.82

Figure No. D.3-3





SAMPLE DATA	
BORING NO.:	B-11
SAMPLE DEPTH (ft):	33-35
DESCRIPTION:	Gray Clay CH

SPECIMEN CONDITIONS	INITIAL	FINAL
MOISTURE CONTENT (%):	81.3	54.5
DRY DENSITY (lb/ft³):	54.0	70.6
VOID RATIO:	2.066	1.345
WET DENSITY (lb/ft³):	97.8	109.0

INDEX PROPERTIES		
LIQUID LIMIT (%):	73	
PLASTIC LIMIT (%):	23	
PLASTICITY INDEX (%):	50	
SPECIFIC GRAVITY:	2.65	(Assumed)
-200 (%):	99.97	

CONSOLIDATION PARAMETERS	
VIRGIN COMPRESSION RATIO, CR:	0.310
RECOMPRESSION RATIO, RR:	0.047
PRECONSOLIDATION PRESSURE, σ'_p:	1.3
COMPRESSION INDEX, Cc:	0.95
RECOMPRESSION INDEX, Cr:	0.14

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BACK BARRIER (BA-193)
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY:	CHECKED BY:	DATE:
RJB		8-10-17
FILE NO.:	APPROVED BY:	FIGURE:
17-84-2810		

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{50} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.0352	0.0352	0.0352		-	-	-	0.7500	0.7500	2.0662	2.0662	0.00	0.00	-----
0.22	0.0352	0.0358	0.0361				0.110	0.7494	0.7492	2.0638	2.0627	0.08	0.11	-----
0.44	0.0365	0.0389	0.0398	120	L	1.38E-01	0.330	0.7468	0.7459	2.0531	2.0494	0.43	0.55	0.00053
0.87	0.0405	0.0485	0.0503	174	L	9.38E-02	0.655	0.7379	0.7362	2.0167	2.0096	1.61	1.85	0.00133
1.74	0.0512	0.0995	0.1055	1860	L	8.08E-03	1.305	0.6879	0.6819	1.8121	1.7876	8.29	9.09	0.01620
3.51	0.1055	0.1920	0.1964	1620	L	7.46E-03	2.625	0.5954	0.5910	1.4340	1.4160	20.62	21.21	0.00800
0.87	0.1955	0.1783	0.1761	576	L	1.85E-02	2.190	0.6081	0.6103	1.4861	1.4951	18.92	18.63	-----
0.44	0.1760	0.1650	0.1617	1560	L	7.21E-03	0.655	0.6213	0.6246	1.5400	1.5535	17.16	16.72	-----
0.87	0.1619	0.1649	0.1655	282	L	4.08E-02	0.655	0.6216	0.6210	1.5413	1.5388	17.12	17.20	-----
1.74	0.1659	0.1782	0.1796	630	L	1.78E-02	1.305	0.6087	0.6073	1.4883	1.4826	18.85	19.03	-----
3.51	0.1801	0.1984	0.2058	492	L	2.16E-02	2.625	0.5889	0.5816	1.4076	1.3775	21.48	22.46	-----
7.04	0.2067	0.2654	0.2711	1680	L	5.38E-03	5.275	0.5228	0.5171	1.1374	1.1140	30.29	31.05	0.00933
1.74	0.2699	0.2480	0.2473	1140	L	7.25E-03	4.390	0.5390	0.5397	1.2036	1.2064	28.13	28.04	-----
0.44	0.2465	0.2150	0.2126	3420	L	2.67E-03	1.090	0.5712	0.5736	1.3352	1.3450	23.84	23.52	-----

				Initial Conditions	Final Conditions		
Project Name:	**Caminada Back Barrier**					EOP= End of Primary Consolidation	
File Number:	**17-84-2810**		Height (in)	0.7500	0.5735	EOI= End of load increment (typically 24 hrs +/-)	
Boring Number:	**B-11**		w_c (%)	81.3	54.5	Specific Gravity	2.65
Depth:	**33-35**		γt (pcf)	97.8	109.0	Ring Diameter (in)	2.0000
			γd (pcf)	54.0	70.6	Ring weight (g)	62.58
LL =	73	-200 = 99.97	Saturation (%)	104.2	107.4	Height of Solids (in)	0.2446
PI =	50	OC = --	Void ratio, e	2.0662	1.3446	Weight of Dry Soil (g)	33.37

Figure No. D.4-2

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} (sec)	Method (L=log, S=sq rt)	Cv (ft^2/day)	Average Effective Stress (tsf)	Height at EOP (inch)	Height at EOI (inch)	Void Ratio at EOP	Void Ratio at EOI	Strain at EOP (%)	Strain at EOI (%)	C $\alpha\varepsilon$
	Initial	EOP	EOI											
0.00	0.0352	0.0352	0.0352		-	-	-	0.7500	0.7500	2.0662	2.0662	0.00	0.00	-----
0.22	0.0352	0.0358	0.0361				0.110	0.7494	0.7492	2.0638	2.0627	0.08	0.11	-----
0.44	0.0366	0.0387	0.0398	470	S	1.52E-01	0.330	0.7470	0.7460	2.0541	2.0498	0.40	0.54	0.00053
0.87	0.0405	0.0474	0.0503	540	S	1.30E-01	0.655	0.7391	0.7362	2.0216	2.0099	1.46	1.84	0.00133
1.74	0.0512	0.0776	0.1055	1815	S	3.68E-02	1.305	0.7098	0.6819	1.9020	1.7879	5.36	9.08	0.01620
3.51	0.1055	0.1816	0.1964	5530	S	9.57E-03	2.625	0.6058	0.5910	1.4768	1.4163	19.22	21.20	0.00800
0.87	0.1955	0.1805	0.1761	1815	S	2.52E-02	2.190	0.6060	0.6104	1.4776	1.4956	19.20	18.61	-----
0.44	0.1761	0.1660	0.1617	5302	S	9.12E-03	0.655	0.6205	0.6248	1.5369	1.5545	17.26	16.69	-----
0.87	0.1621	0.1647	0.1655	1215	S	4.08E-02	0.655	0.6222	0.6214	1.5439	1.5406	17.04	17.14	-----
1.74	0.1659	0.1771	0.1796	2381	S	2.03E-02	1.305	0.6102	0.6077	1.4948	1.4846	18.64	18.97	-----
3.51	0.1800	0.1988	0.2058	2233	S	2.05E-02	2.625	0.5889	0.5820	1.4077	1.3793	21.48	22.40	-----
7.04	0.2063	0.2537	0.2711	4234	S	9.39E-03	5.275	0.5346	0.5172	1.1855	1.1144	28.72	31.04	0.00933
1.74	0.2699	0.2528	0.2473	2857	S	1.23E-02	4.390	0.5343	0.5398	1.1843	1.2068	28.76	28.03	-----
0.44	0.2473	0.2163	0.2126	13142	S	2.99E-03	1.090	0.5708	0.5745	1.3335	1.3486	23.90	23.40	-----

				Initial Conditions	Final Conditions		
Project Name:	**Caminada Back Barrier**					EOP= End of Primary Consolidation	
File Number:	**17-84-2810**		Height (in)	0.7500	0.5735	EOI= End of load increment (typically 24 hrs +/-)	
Boring Number:	**B-11**		w_c (%)	81.3	54.5	Specific Gravity	2.65
Depth:	**33-35**		γt (pcf)	97.8	109.0	Ring Diameter (in)	2.0000
			γd (pcf)	54.0	70.6	Ring weight (g)	62.58
LL =	73	-200 = 99.97	Saturation (%)	104.2	107.4	Height of Solids (in)	0.2446
PI =	50	OC = --	Void ratio, e	2.0662	1.3446	Weight of Dry Soil (g)	33.37

Appendix E. T. B. SMITH MAGNETOMETER & SURVEY

This Appendix contains the following:

E.1 Hazard Survey Map

LAFOURCHE PARISH, LOUISIANA
T22S - R23E

"TE23-SM-01"
ELEV = 7.30' NAVD88 (GEOID12A)

X = 3,645,688.81'	NAD 83
Y = 224,296.37'	
LAT = 29° 06' 42.2851"	NAD 83
LONG = 90° 11' 26.9637"	

17,647' ±

T22S-R23E
T23S-R23E

CPT-28 / B-09 · CPT-29 · CPT-30 · CPT-31 · CPT-32 · CPT-33 / B-10 · CPT-34 · CPT-35 · CPT-36 · CPT-37 / B-11 · CPT-38

LOUISIANA COORDINATE SYSTEM (SOUTH ZONE) (1983 DATUM)

GULF OF MEXICO

I CERTIFY THAT THE TOPOGRAPHIC SURVEY DEPICTED ON THIS PLAT WAS PERFORMED ON THE GROUND UNDER MY SUPERVISION IN ACCORDANCE WITH GENERALLY ACCEPTED SURVEY PRACTICES. THIS SURVEY DOES NOT MEET THE STANDARDS OF PRACTICE FOR BOUNDARY SURVEYS AS SET FORTH BY THE LOUISIANA PROFESSIONAL ENGINEERING AND LAND SURVEYING BOARD.

APPROVED: Evan M. Chiasson 7-3-17
EVAN M. CHIASSON, P.L.S.
LA. LAND SURVEYOR REG. NO. 5139

STATE OF LOUISIANA — Evan M. Chiasson License No. 5139 PROFESSIONAL LAND SURVEYOR

SURVEY NOTES:

1. FIELD SURVEY WAS PERFORMED JUNE 30,2017 BY T. BAKER SMITH, LLC (TBS).
2. TBS FIELD CREW PULLED GRADIOMETER AT A RADII OF 25' AROUND EACH BORING AND CPT STAKE SET BY ARDAMAN & ASSOCIATES, INC. NO ANOMALIES WERE DETECTED DURING THESE INVESTIGATIONS.
3. ALL GRID COORDINATES ARE EXPRESSED IN LOUISIANA STATE PLANE, SOUTH ZONE, NAD 83, IN US SURVEY FEET. GEOGRAPHIC COORDINATES ARE NAD 83.
4. THE VERTICAL DATUM FOR ALL ELEVATIONS IS NAVD 88 (GEOID 12A), IN U.S. SURVEY FEET.
5. THE REFERENCE BENCHMARK FOR THIS SURVEY IS "TE23-SM-01".
6. BACKGROUND IMAGERY SOURCED FROM 2015 DOQQ AERIAL PHOTOGRAPHY.
7. WHILE REASONABLE EFFORTS ARE MADE TO LOCATE ALL PIPELINES, METAL OBJECTS OR OTHER SUBSURFACE OBSTRUCTIONS IN THE SURVEYED AREA, THE EQUIPMENT USED AND THE CHARACTERISTICS OF PIPELINES THEMSELVES MAKE IT IMPOSSIBLE TO GUARANTEE TOTAL SUCCESS. ACCORDINGLY, IT IS INCUMBENT UPON THE OWNERS, OPERATORS AND/OR CONTRACTORS CONDUCTING OPERATIONS INCLUDING DREDGING AND EXCAVATION TO CONDUCT THEIR OPERATIONS WITH EXTREME CAUTION AND RECOGNIZE THAT HAZARDS IN ADDITION TO THOSE DETECTED AND MARKED BY TBS MAY EXIST.

Legend

- Soil Boring (B)
- Cone Penetration Test (CPT)
- Benchmark

BORING LOCATIONS

DESCRIPTION	COORDINATES (NAD83)		COORDINATES (NAD83)		WATER DEPTH	BOTTOM ELEVATION
	EASTING	NORTHING	LATITUDE	LONGITUDE		
B-09	3,660,667	233,618	29° 8' 13.05"	90° 8' 37.03"	1.7'	0.9'
B-10	3,669,005	239,864	29° 9' 14.02"	90° 7' 2.28"	1.0'	0.2'
B-11	3,675,699	244,831	29°10' 2.47"	90° 5' 46.18"	1.3'	0.5'

CONE PENETRATION TEST(CPT) LOCATIONS

DESCRIPTION	COORDINATES (NAD83)		COORDINATES (NAD83)		WATER DEPTH	BOTTOM ELEVATION
	EASTING	NORTHING	LATITUDE	LONGITUDE		
CPT-28	3,660,661	233,622	29° 8' 13.09"	90° 8' 37.10"	1.7'	0.7'
CPT-29	3,661,754	234,497	29° 8' 21.64"	90° 8' 24.68"	3.3'	2.5'
CPT-30	3,663,073	235,387	29° 8' 30.30"	90° 8' 9.70"	3.8'	3.0'
CPT-31	3,664,469	236,468	29° 8' 40.87"	90° 7' 53.83"	2.9'	2.1'
CPT-32	3,665,951	237,605	29° 8' 51.98"	90° 7' 36.98"	2.7'	1.9'
CPT-33	3,668,913	239,993	29° 9' 15.30"	90° 7' 3.30"	1.0'	0.2'
CPT-34	3,670,870	241,562	29° 9' 30.62"	90° 6' 41.04"	1.2'	0.4'
CPT-35	3,672,529	242,540	29° 9' 40.13"	90° 6' 22.21"	2.4'	1.6'
CPT-36	3,674,321	243,818	29° 9' 52.59"	90° 6' 1.85"	0.9'	0.1'
CPT-37	3,675,693	244,836	29° 10' 2.52"	90° 5' 46.25"	1.3'	0.5'
CPT-38	3,676,459	245,782	29° 10' 11.80"	90° 5' 37.50"	4.1'	3.3'

*TOP OF WATER AT TIME OF SURVEY= +0.8' (NAVD 88)

CPRA

T. BAKER SMITH
A CENTURY OF SOLUTIONS
412 South Van Ave, Houma, LA 70363
(985)868-1050 - tbsmith.com

SCALE: 1" = 2000'
2000' 1000' 0' 2000'

REV. NO:	REV. DATE:	REV. BY:
00	--/--/--	---

REVISION DESCRIPTION: --

DRAWN BY:	ARV	APPROVED BY:	KAK
DATE:	07/03/2017	JOB NO:	2017.0585
DRAWING NAME:	2017.0585T01.DWG		
PROJECTION: LA SOUTH ZONE 1702 GEO. DATUM: NAD83 | VERT. DATUM: NAVD88 GRID UNITS: US SURVEY FEET			
SHEET NO:	1 OF 1		

HAZARD SURVEY

ARDAMAN & ASSOCIATES, LLC

MAGNETOMETER SURVEY OF
SOIL BORING AND CONE PENETRAIONS TEST LOCATIONS
FOR COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER (BA-193)
LAFOURCHE PARISH, LOUISIANA

7/3/2017 - P:\Y-2017\2017.0585\DWG\2017.0585T01.DWG

Figure No. E.1

LAFOURCHE AND JEFFERSON PARISHES, LOUISIANA
T22S - R23E AND T22S - R24E

I CERTIFY THAT THE TOPOGRAPHIC SURVEY DEPICTED ON THIS PLAT WAS PERFORMED ON THE GROUND UNDER MY SUPERVISION IN ACCORDANCE WITH GENERALLY ACCEPTED SURVEY PRACTICES. THIS SURVEY DOES NOT MEET THE STANDARDS OF PRACTICE FOR BOUNDARY SURVEYS AS SET FORTH BY THE LOUISIANA PROFESSIONAL ENGINEERING AND LAND SURVEYING BOARD.

APPROVED: _____

JAMES B. PELLEGRIN
LA. LAND SURVEYOR REG. NO. 4828
BOX 2266, HOUMA, LA. 70361 (985) 868-1050

JAMES B. PELLEGRIN
REG. No. 4828
REGISTERED
PROFESSIONAL
LAND SURVEYOR
STATE OF LOUISIANA

SURVEY NOTES:

1. SURVEY WAS PERFORMED FEBRUARY 28, 2018 BY T. BAKER SMITH, LLC (TBS).
2. TBS FIELD CREW PULLED GRADIOMETER AT A RADII OF 25' AROUND EACH CPT STAKE SET BY ARDAMAN & ASSOCIATES, INC. NO ANOMALIES WERE DETECTED DURING THESE INVESTIGATIONS.
3. ALL GRID COORDINATES ARE EXPRESSED IN LOUISIANA STATE PLANE, SOUTH ZONE, NAD 83, IN US SURVEY FEET. GEOGRAPHIC COORDINATES ARE NAD 83.
4. THE VERTICAL DATUM FOR ALL ELEVATIONS IS NAVD 88 (GEOID 12A), IN U.S. SURVEY FEET.
5. BACKGROUND IMAGERY SOURCED FROM 2015 DOQQ AERIAL PHOTOGRAPHY.
6. WHILE REASONABLE EFFORTS ARE MADE TO LOCATE ALL PIPELINES, METAL OBJECTS OR OTHER SUBSURFACE OBSTRUCTIONS IN THE SURVEYED AREA, THE EQUIPMENT USED AND THE CHARACTERISTICS OF PIPELINES THEMSELVES MAKE IT IMPOSSIBLE TO GUARANTEE TOTAL SUCCESS. ACCORDINGLY, IT IS INCUMBENT UPON THE OWNERS, OPERATORS AND/OR CONTRACTORS CONDUCTING OPERATIONS INCLUDING DREDGING AND EXCAVATION TO CONDUCT THEIR OPERATIONS WITH EXTREME CAUTION AND RECOGNIZE THAT HAZARDS IN ADDITION TO THOSE DETECTED AND MARKED BY TBS MAY EXIST
7. COORDINATES DERIVED FROM OPUS SOLUTION WITH NEAREST CONTROLLING C.O.R.S. REFERENCE STATION: "LUMCON" CHAUVIN, LA...

Legend

Cone Penetration Test (CPT)

Benchmark

CONE PENETRATION TEST(CPT) LOCATIONS

DESCRIPTION	COORDINATES (NAD83)		COORDINATES (NAD83)		WATER DEPTH	BOTTOM ELEVATION
	EASTING	NORTHING	LATITUDE	LONGITUDE		
CPT-48	3,678,206	246,759	29° 10' 21.28"	90° 05' 17.67"	1.5	-1.5'
CPT-50	3,679,772	247,984	29° 10' 33.25"	90° 04' 59.85"	1.7	-1.7'
CPT-52	3,681,287	249,123	29° 10' 44.36"	90° 04' 42.63"	1.3	-1.3'
CPT-53	3,682,785	250,319	29° 10' 56.03"	90° 04' 25.58"	1.0	-1.0'

*TOP OF WATER AT TIME OF SURVEY= 0.0' (NAVD 88)

CPRA

T. BAKER SMITH
A CENTURY OF SOLUTIONS
412 South Van Ave, Houma, LA 70363
(985)868-1050 - tbsmith.com

SCALE: 1" = 1000'

1000' 500' 0' 1000'

REV. NO:	REV. DATE:	REV. BY:
00	--/--/--	---

REVISION DESCRIPTION:
--

DRAWN BY:	BPMc	APPROVED BY:	KAK
DATE:	03/08/2018	JOB NO:	2018.0151
DRAWING NAME:		2018.0151_TO1.DWG	

PROJECTION: LA SOUTH ZONE 1702
GEO. DATUM: NAD83 | VERT. DATUM: NAVD88
GRID UNITS: US SURVEY FEET

SHEET NO: 1 OF 1

HAZARD SURVEY

ARDAMAN & ASSOCIATES, LLC

MAGNETOMETER SURVEY OF
CONE PENETRAIONS TEST LOCATIONS
FOR COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER (BA-193)
LAFOURCHE AND JEFFERSON PARISHES, LOUISIANA

3/15/2018 - P:\Y-2018\2018.0151\DWG\2018.0151_TO1.DWG

Figure No. E.2